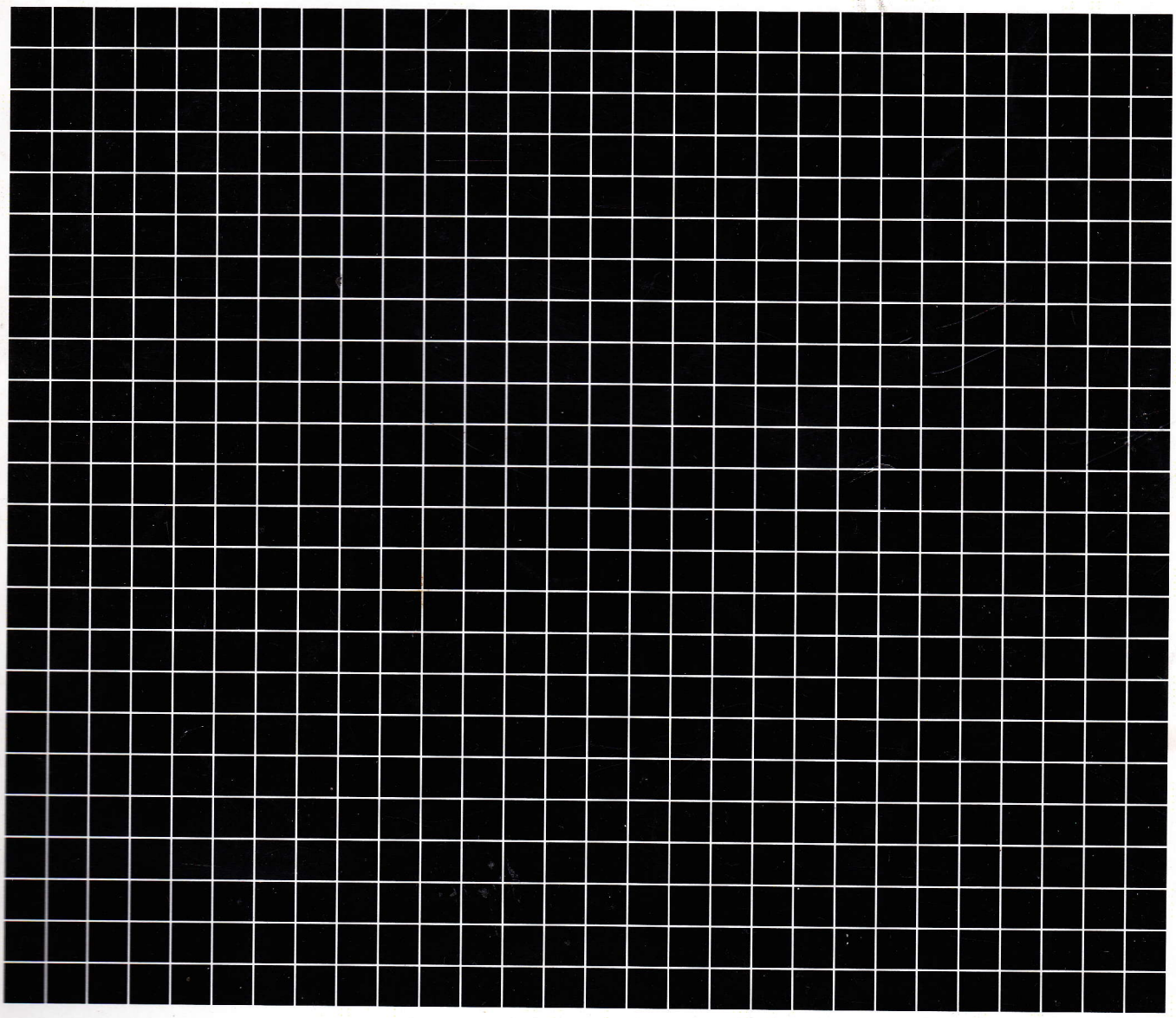
HONDA
Power
Equipment

SHOP MANUAL

GENERATOR

E/ES3500



PART NO. 6188000

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A FEW WORDS ABOUT SAFETY

SERVICE INFORMATION

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you, or others. It could also damage the equipment or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance, and repairs. Some procedures require the use of specially designed tools. Any person who intends to use a replacement part, service procedure, or a tool that is not recommended by Honda, must determine the risks to their personal safety and the safe operation of the equipment.

If you need to replace a part, use genuine Honda parts with the correct part number, or an equivalent part. We strongly recommend you do not use replacement parts of an inferior quality.

For Your Customer's Safety

Proper service and maintenance are essential to the customer's safety and the reliability of the equipment. Any error or oversight while servicing the equipment can result in faulty operation, damage to the equipment, or injury to others.

⚠ WARNING

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

For Your Safety

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (e.g., Hot parts—wear gloves). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practices, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service and repair procedures. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

- Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:
  - ❑ Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
  - ❑ Protect your eyes by using proper safety glasses, goggles, or face shields any time you hammer, drill, grind, or work around pressurized air or liquids, and springs or other stored-energy components. If there is any doubt, put on eye protection.
  - ❑ Use other protective wear when necessary, for example, gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:
  - ❑ Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
  - ❑ Burns from hot parts. Let the engine and exhaust system cool before working in those areas.
  - ❑ Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers, and clothing are out of the way.
- Gasoline vapors are explosive. To reduce the possibility of fire or explosion, be careful when working around gasoline.
  - ❑ Use only a nonflammable solvent, not gasoline, to clean parts.
  - ❑ Never drain or store gasoline in an open container.
  - ❑ Keep all cigarettes, sparks, and flames away from all fuel-related parts.

PREFACE

This manual covers construction, function and servicing procedures of the Honda E3500 and ES3500 generators.

Careful observance of the instructions given herein will result in better, safer service work.

The information in this manual is based mainly on the ES3500 K1 but applies to other types unless otherwise specified.

The E/ES3500 K0 generators are powered by the Honda G80 engine. The K1 models are powered by the Honda G400 engine.

Refer to the "Honda G300/G400 Shop Manual" or "Honda G65/G80 Shop Manual" for information on the construction, inspection and maintenance of these engines.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. HONDA MOTOR CO., LTD. RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT INCURRING ANY OBLIGATION WHATEVER.

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I. SPECIFICATIONS

1. SPECIFICATIONS
2. CHARACTERISTICS
3. PERFORMANCE CURVES
4. DIMENSIONAL DRAWINGS
5. WIRING DIAGRAM

1. SPECIFICATIONS

• E3500

ITEM	K1	K0
DIMENSIONS AND WEIGHTS		
Overall length	715 mm (28.2 in)	715 mm (28.2 in)
Overall width	415 mm (16.3 in)	405 mm (15.9 in)
Overall height	595 mm (23.4 in)	595 mm (23.4 in)
Dry weight	89.5 kg (207 lb)	82.5 kg (182 lb)
Curb weight	100.5 kg (231 lb)	94.0 kg (207 lb)
GENERATOR		
Type	Self-exciting, 2-poles, single phase, rotating field	
Rated output	AC: 2.8 kVA DC: 100W (12 V, 8.3 A)	
Max. output	3.5 kVA	
Rated voltage	115/230 V	
Rated current	24.3/12.2 A	
Rated frequency	60 Hz	
Voltage regulating system	A.V.R. (Automatic Voltage Regulator) system	
ENGINE		
Model	HONDA G400 gasoline engine	HONDA G80 gasoline engine
Type	4-Stroke, side valve, 1 cylinder	4-Stroke, side valve, 1 cylinder
Total displacement	406 cc (24.8 cu in)	296 cc (18.0 cu in)
Max. horsepower	10HP/3,600rpm	8.0HP/4,000rpm
Max. torque	230 kg-cm (16.6 ft-lb)	160 kg-cm (11.6 ft-lb)
Engine speed	3,100 rpm	3,500 rpm
Compression ratio	6.5 : 1	6.3 : 1
Fuel consumption	270g/HPh	285g/HPh
Cooling system	Forced air	Forced air
Ignition system	Flywheel magneto	Flywheel magneto
Ignition timing	20° B.T.D.C. (Fixed)	25° B.T.D.C. (Fixed)
Spark plug	B-4H, BR-4HS (NGK)	B-6HS, BR-6HS (NGK)
Carburetor	Horizontal type, butterfly valve	Horizontal type, butterfly valve
Air cleaner	Dual element type	Semi-dry type
Governor	Centrifugal governor	Centrifugal governor
Lubricating system	Splash type	Splash type
Oil capacity	1.2 ℓ (2.54 US pt)	1.1 ℓ (2.3 US pt)
Starting system	Recoil starter	Recoil starter
Stopping system	Ground of primary circuit	Ground of primary circuit
Tank capacity	14 ℓ (3.7 US gal)	14 ℓ (3.7 US gal)

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• ES3500

ITEM	K1	K0
DIMENSIONS AND WEIGHTS		
Overall length	715 mm (28.2 in)	715 mm (28.2 in)
Overall width	415 mm (16.3 in)	405 mm (15.9 in)
Overall height	595 mm (23.4 in)	595 mm (23.4 in)
Dry weight	89.5 kg (207 lb)	87.5 kg (193 lb)
Curb weight	100.5 kg (231 lb)	99.0 kg (218 lb)
GENERATOR		
Type	Self-exciting, 2-poles, single phase, rotating field	
Rated output	AC: 2.8 kVA DC: 100W (12 V, 8.3 A)	
Max. output	3.5 kVA	
Rated voltage	115/230 V	
Rated current	24.3/12.2 A	
Rated frequency	60 Hz	
Voltage regulating system	A.V.R. (Automatic Voltage Regulator) system	
ENGINE		
Model	HONDA G400 gasoline engine	HONDA G80 gasoline engine
Type	4-stroke, side valve, 1 cylinder	4-stroke, side valve, 1 cylinder
Total displacement	406 cc (24.8 cu in)	296 cc (18.0 cu in)
Max. horsepower	10 HP/3,600 rpm	8.0 HP/4,000 rpm
Max. torque	230 kg-cm (16.6 ft-lb)	160 kg-cm (11.6 ft-lb)
Engine speed	3,100 rpm	3,500 rpm
Compression ratio	6.5 : 1	6.3 : 1
Fuel consumption	270 g/HPh	285 g/HPh
Cooling system	Forced air	Forced air
Ignition system	Flywheel magneto	Flywheel magneto
Ignition timing	20° B.T.D.C. (Fixed)	25° B.T.D.C. (Fixed)
Spark plug	B-4H, BR-4HS (NGK)	B-6HS, BR-6HS (NGK)
Carburetor	Horizontal type, butterfly valve	Horizontal type, butterfly valve
Air cleaner	Dual element type	Semi-dry type
Governor	Centrifugal governor	Centrifugal governor
Lubricating system	Splash type	Splash type
Oil capacity	1.2 ℓ (2.54 US pt)	1.1 ℓ (2.3 US pt)
Starting system	Recoil starter or electric starter	Recoil starter or electric starter
Stopping system	Ground of primary circuit	Ground of primary circuit
Tank capacity	14 ℓ (3.7 US gal)	14 ℓ (3.7 US gal)

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2. CHARACTERISTICS

NOTE: Characteristics are the same for both the K1 and K0 models of the E3500 and ES3500.

Voltage variation rate	Momentary: 15% max. Average: 7% max. Average time: 5 seconds max.
Frequency variation rate	Momentary: 20% max. Average: 10% max. Average time: 5 seconds max.
Voltage stability	±1%
Frequency stability	±1%
Rated power factor	0.8–1.0
Insulation resistance	10 MΩ
Max. load	110%
Circuit breaker capacity	31.5 A/115 V 16 A/230 V
Fuse capacity (DC)	15 A
Fuel consumption ratio (at rated load)	2.5 ℓ/h (0.66 US gal/h)
Motor drive	750 W max.

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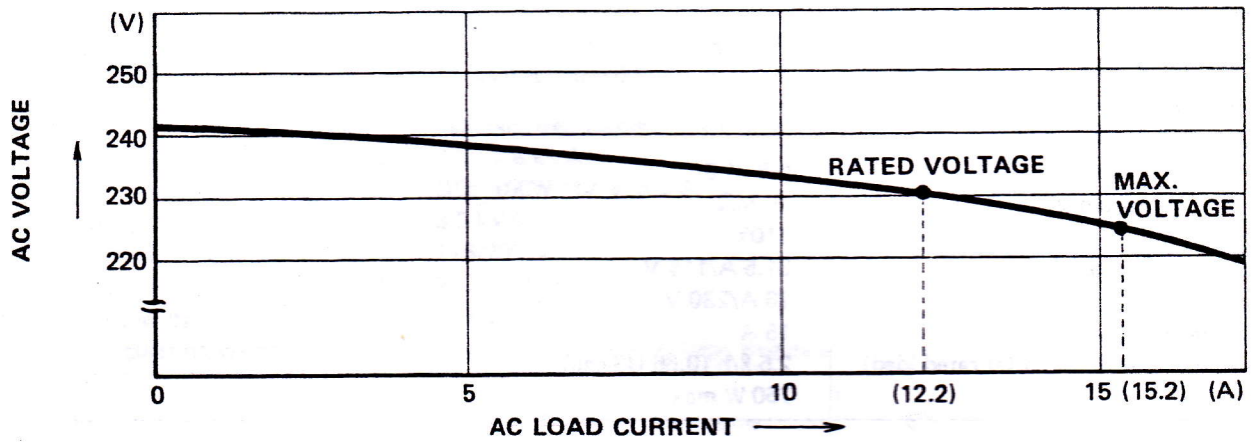
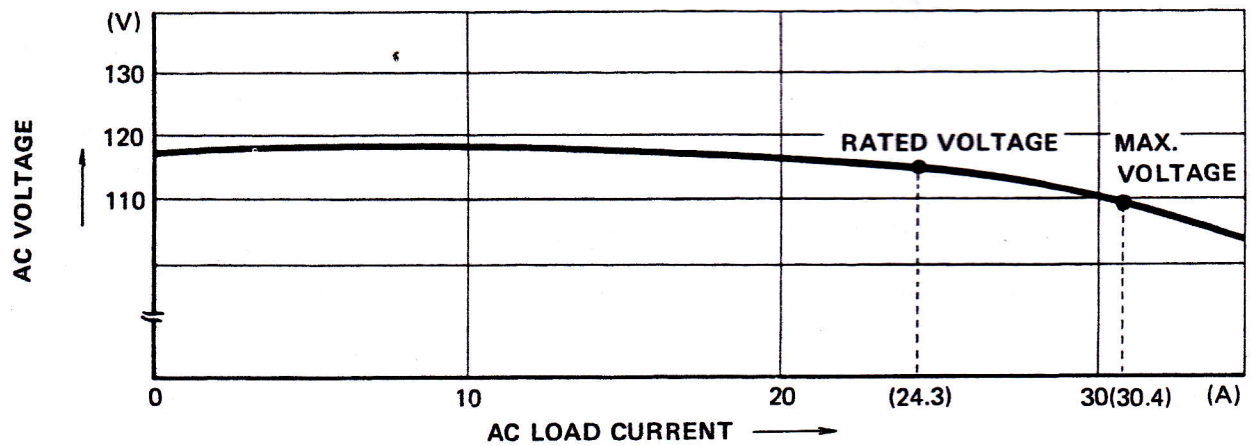
3. PERFORMANCE CURVES

The curves show performance of the generator under average conditions. Performance may vary to some degree depending on ambient temperature and humidity. The output voltage will be higher than usual when the generator is still cold immediately after the engine starts.

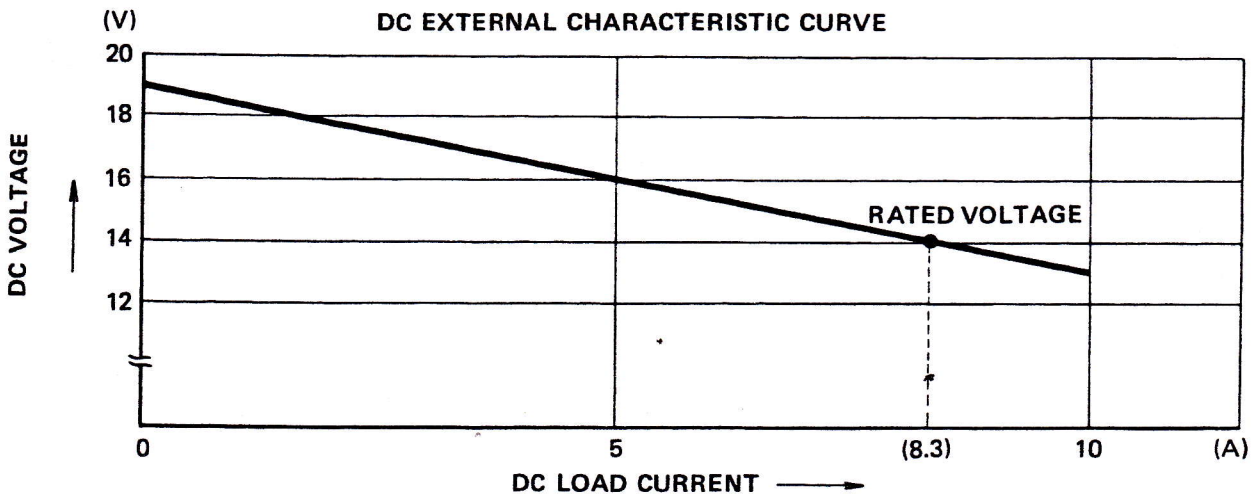
AC 230V EXTERNAL CHARACTERISTIC CURVE



AC 115V EXTERNAL CHARACTERISTIC CURVE



DC EXTERNAL CHARACTERISTIC CURVE



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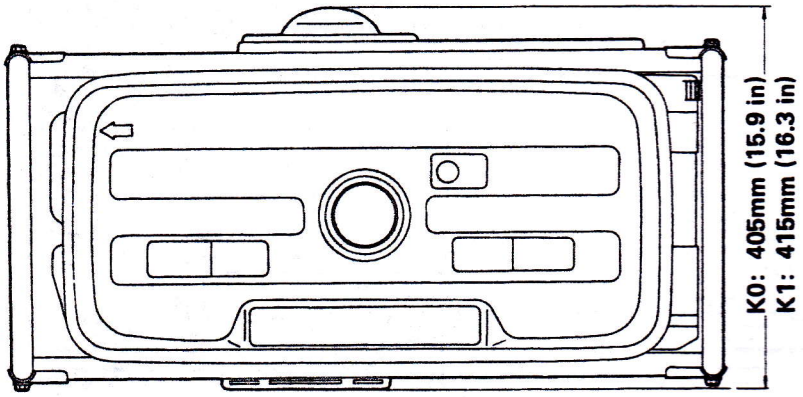
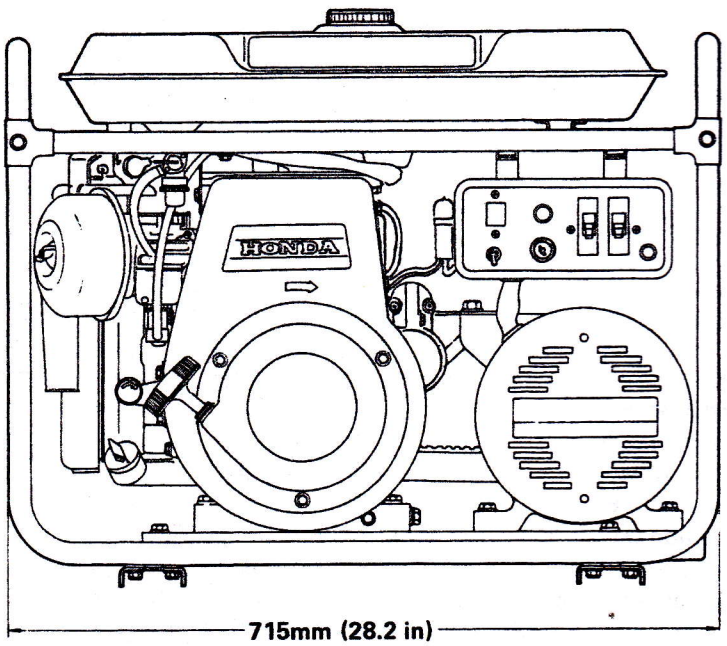
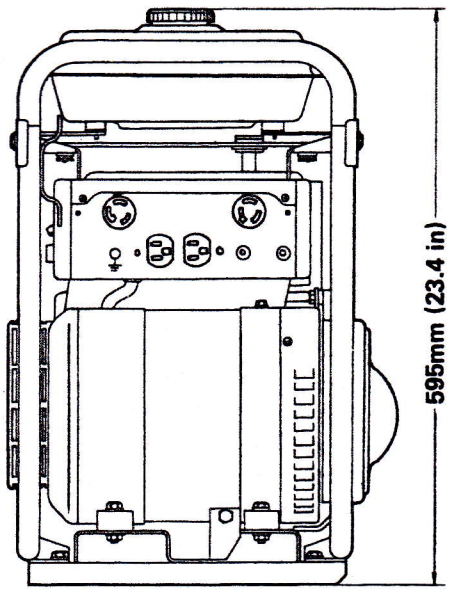
4. DIMENSIONAL DRAWINGS

(ES3500K1 shown)







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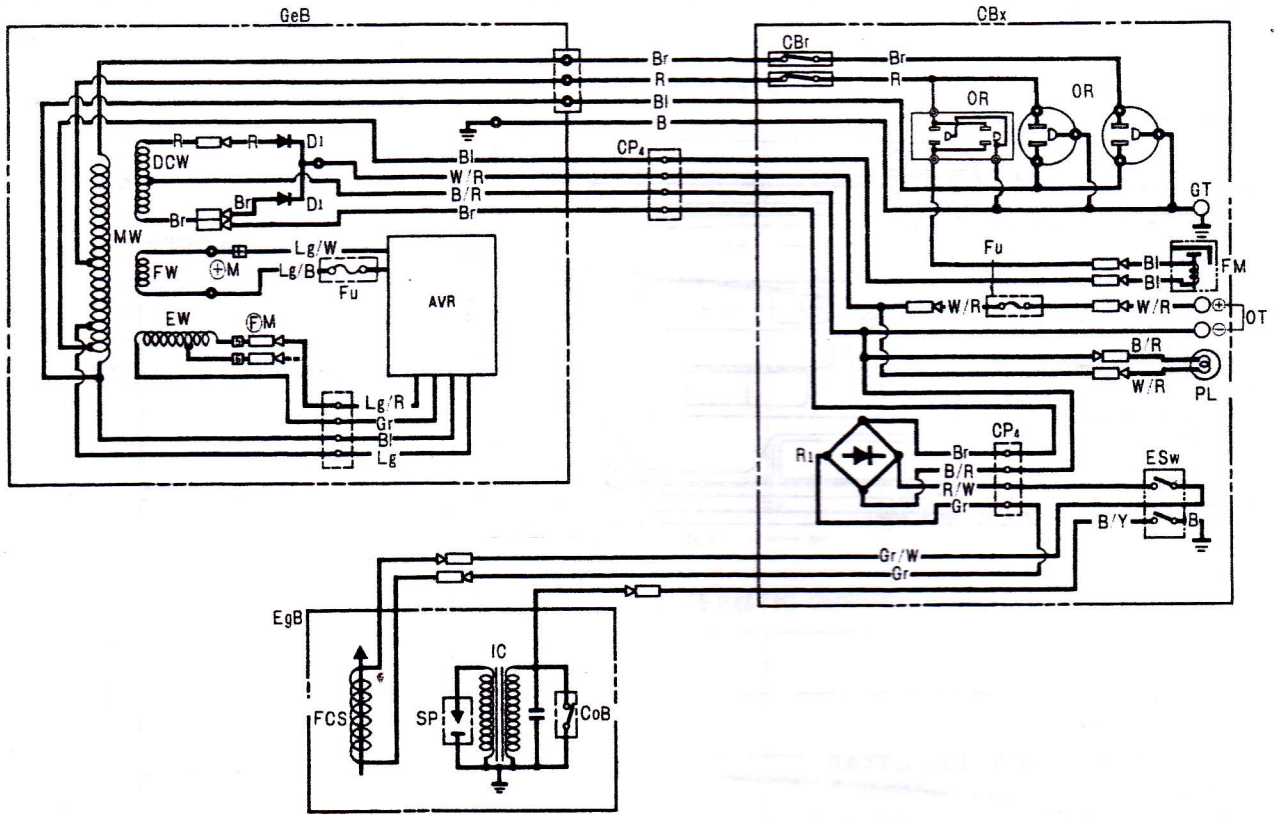
5. WIRING DIAGRAM

● E3500



AVR	Automatic Voltage Regulator	Ⓕ M	Frequency Mark	B	Black
CBr	Circuit Breaker	Fu	Fuse	Bl	Blue
CBx	Control Box	FW	Field Winding	Br	Brown
CoB	Contact Breaker	GeB	Generator Block	Gr	Green
CP_4	4P Connector	IC	Ignition Coil	Gr/W	Green/White
DCW	DC Winding	MW	Main Winding	Lg	Light Green
D1	Diode (DC Circuit)	OR	Output Receptacle	Lg/B	Light Green/Black
EgB	Engine Block	OT	DC Output Terminal	Lg/R	Light Green/Red
ESw	Engine Switch	PL	Pilot Lamp	Lg/W	Light Green/White
GT	Ground Terminal	R1	Rectifier	R	Red
EW	Exciter Winding	SP	Spark Plug	R/B	Red/Black
FCS	Fuel Cut Solenoid	⊕ M	+ Mark	R/W	Red/White
FM	Frequency Meter			Y/B	Yellow/Black

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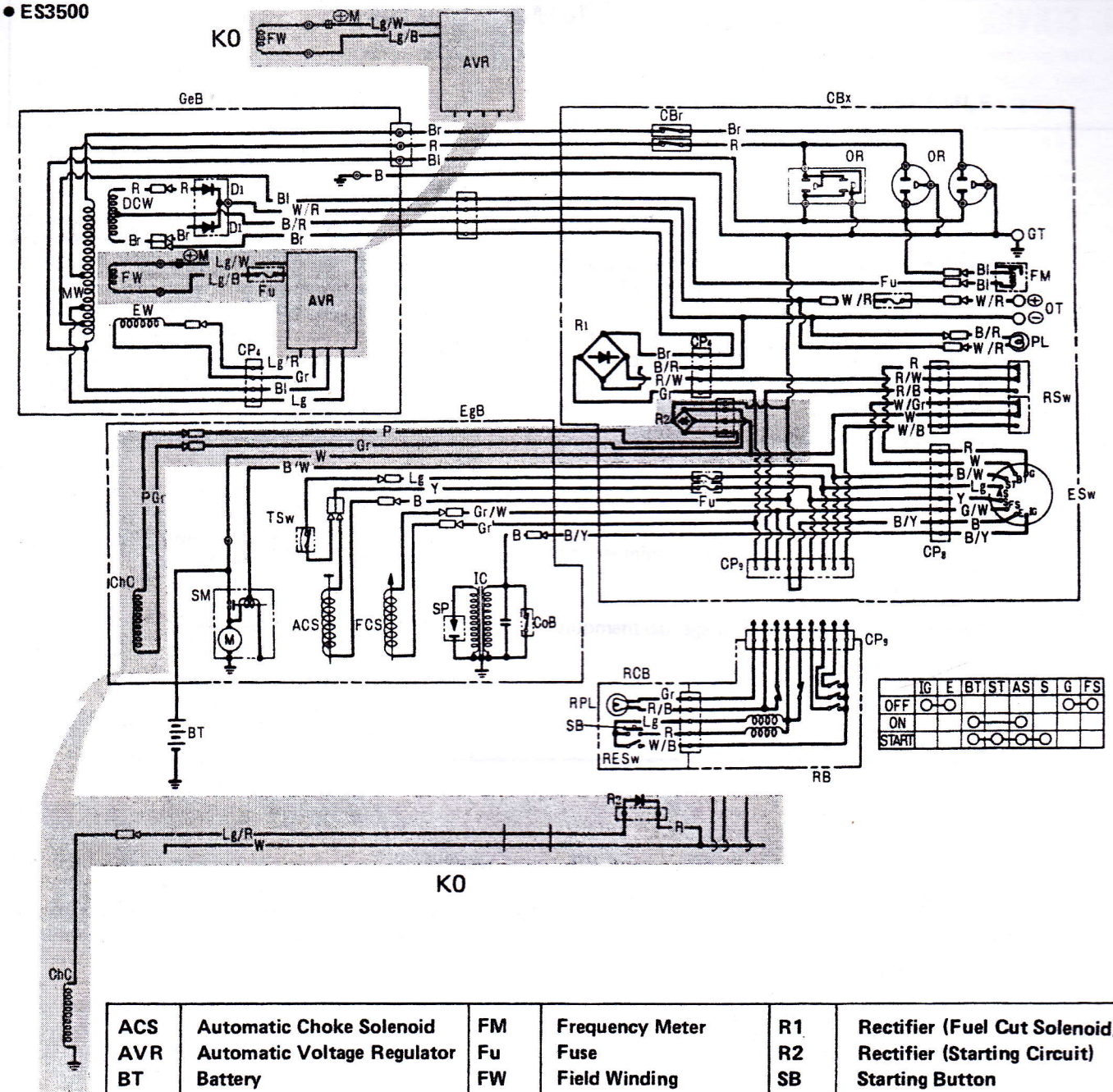
● ES3500



ACS	Automatic Choke Solenoid	FM	Frequency Meter	R1	Rectifier (Fuel Cut Solenoid)
AVR	Automatic Voltage Regulator	Fu	Fuse	R2	Rectifier (Starting Circuit)
BT	Battery	FW	Field Winding	SB	Starting Button
CBr	Circuit Breaker	GeB	Generator Block	SM	Starting Motor
CBx	Control Box	IC	Ignition Coil	SP	Spark Plug
ChC	Charging Coil	MW	Main Winding	TSw	Thermostat Switch
CoB	Contact Breaker	OR	Output Receptacle	⊕M	+ Mark
CP~	~ P Connector	OT	DC Output Terminal	B	Black
DCW	DC Winding	PL	Pilot Lamp	Bl	Blue
D1	Diode (DC Circuit)	RB	Relay Box	Br	Brown
EgB	Engine Block	RCB	Remote Control Box	Gr	Green
ESw	Engine Switch	RESw	Remote Engine Switch	Lg	Light Green
GT	Ground Terminal	RPL	Remote Pilot Lamp	P	Pink
EW	Exciter Winding	RSw	Remote Control Switch	R	Red
FCS	Fuel Cut Solenoid			W	White
				Y	Yellow

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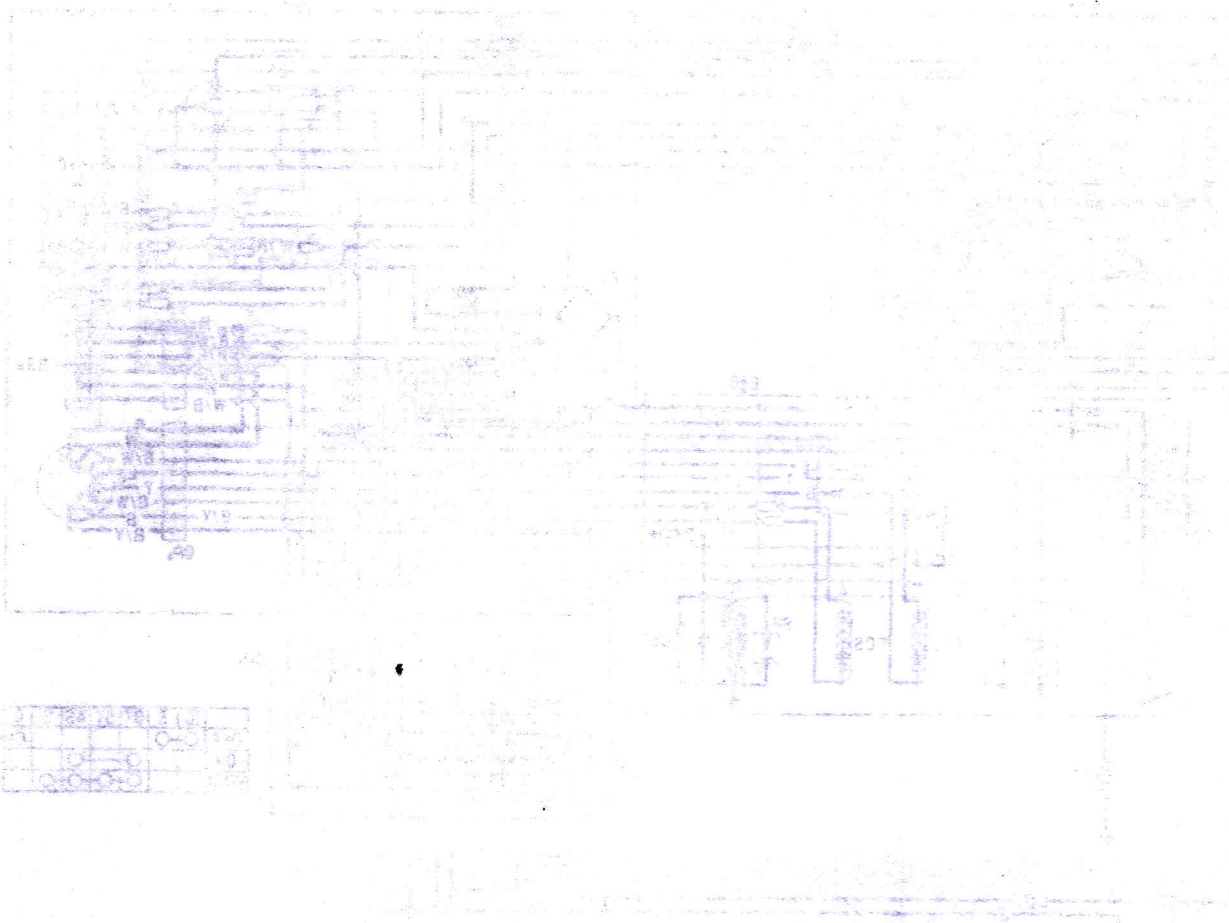

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II. SERVICE INFORMATION

1. GENERAL SAFETY
2. SERIAL NUMBER LOCATIONS
3. SERVICE RULES
4. TORQUES
5. TROUBLESHOOTING
6. MAINTENANCE SCHEDULE

1. GENERAL SAFETY

WARNING

1. Stop the engine before servicing it. If the engine must be running to do some work, observe the precautions:
   * Never run the engine in a closed area; make sure the area is well ventilated.
     The exhaust contains poisonous carbon monoxide gas.
   * Keep away from rotating or hot parts and high tension electrical parts.
2. Gasoline is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.

- INDEXES AND MARKINGS

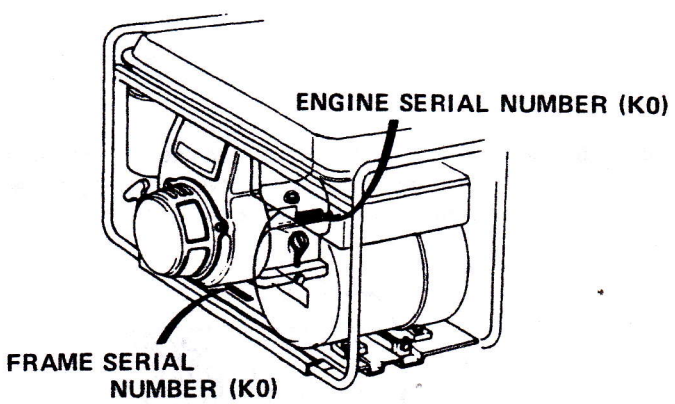
WARNING : Indicates a possibility of personal injury or loss of life if instructions are not followed.

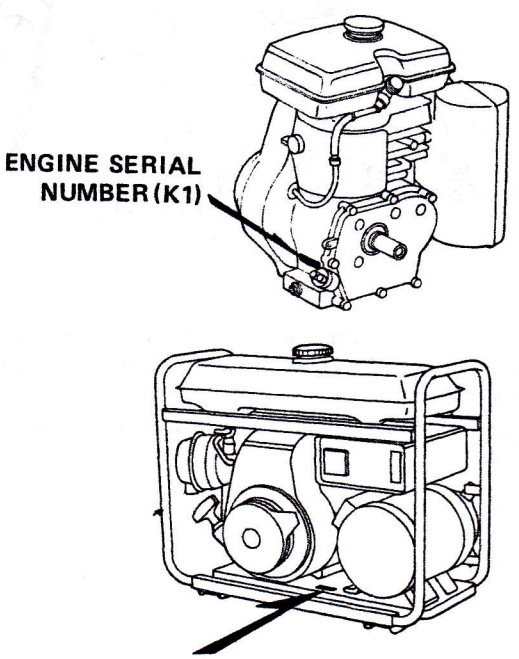
CAUTION : Indicates a possibility of equipment damage if instructions are not followed.

S. TOOL : Use special tool

2. SERIAL NUMBER LOCATIONS

The engine serial number is stamped on the cylinder barrel. The frame serial number is on the engine bed.
Always specify these numbers when inquiring about the generator or ordering parts in order to get correct parts for the unit being serviced.





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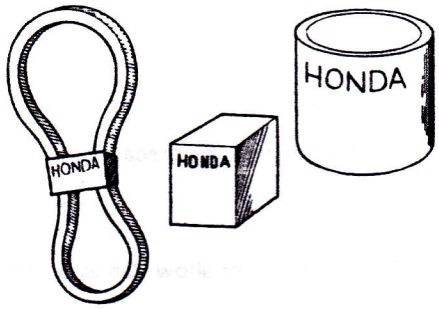
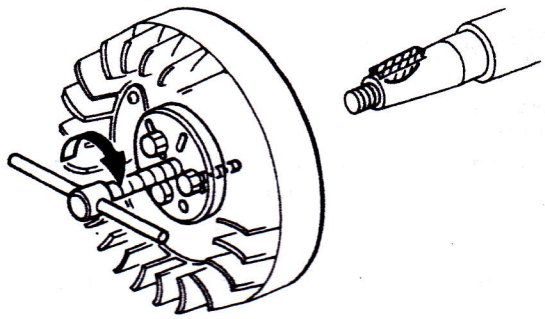
3. SERVICE RULES

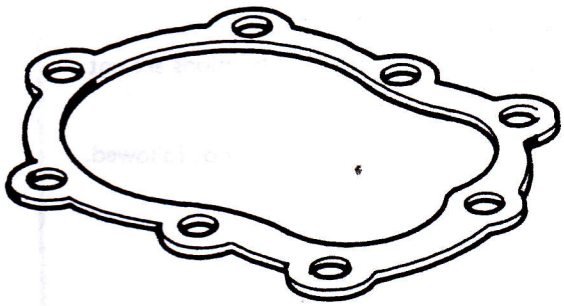
1. Use genuine HONDA or HONDA-recommended parts or their equivalent. Parts that don't meet HONDA's design specifications may damage the engine.



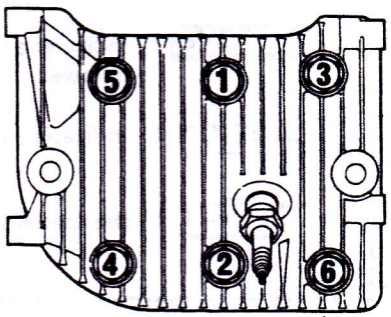
2. Use the special tools designed for this product.



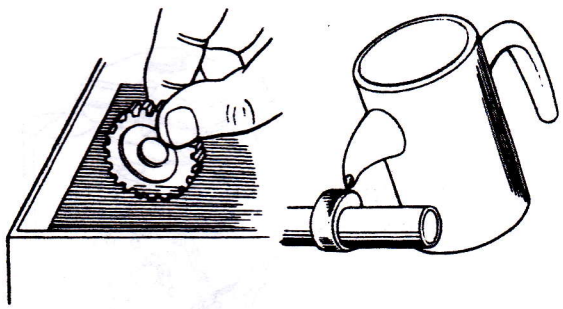
3. Install new gaskets, O-rings, cotter pins, lock plates, etc. when reassembling.



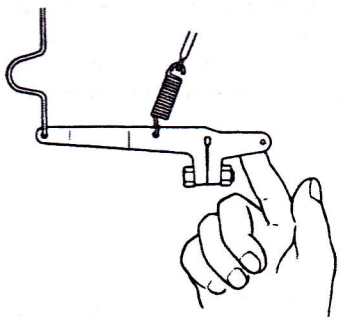
4. When torquing bolts or nuts, begin with larger-diameter inner bolt first, and tighten to the specified torque diagonally unless a particular sequence is specified.



5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.

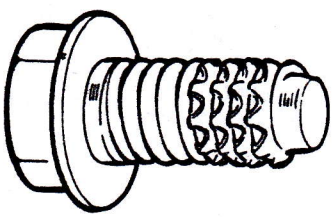


6. After reassembly, check all parts for proper installation and operation.



7. Use only metric tools when servicing this engine. Metric bolts, nuts, and screws are not interchangeable with English fasteners.
   The use of incorrect tools and fasteners may damage the engine.

8. Many screws used in this machine are self-tapping. Be aware that misthreading or overtightening these screws will strip the female threads and ruin the hole.



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4. TORQUES

Tightening point	Thread dia. (mm)	Torque
Driven pulley nut	18	600-800 kg-cm (43-48 ft-lb)
Drive pulley bolt	8	200-280 kg-cm (15-20 ft-lb)
Drive pulley attaching bolt (K1 only)	6	80-120 kg-cm (5.8-8.7 ft-lb)
Generator mount bolt	10	400-500 kg-cm (29-36 ft-lb)
Engine mount bolt	8	200-280 kg-cm (15-20 ft-lb)
Engine mount bolt	10	400-500 kg-cm (29-36 ft-lb)
Voltage conversion terminal	6	30-60 kg-cm (2.2-4.3 ft-lb)
AVR and condenser	5	20-40 kg-cm (1.4-2.9 ft-lb)
Brush holder	4	10-20 kg-cm (0.7-1.4 ft-lb)

● STANDARD TORQUE

Thread dia.	Torque
5mm bolt, nut	40-70 kg-cm (2.9-5.1 ft-lb)
6mm bolt, nut	80-120 kg-cm (5.8-8.7 ft-lb)
8mm bolt, nut	200-280 kg-cm (15-20 ft-lb)
10mm bolt, nut	350-400 kg-cm (25-29 ft-lb)

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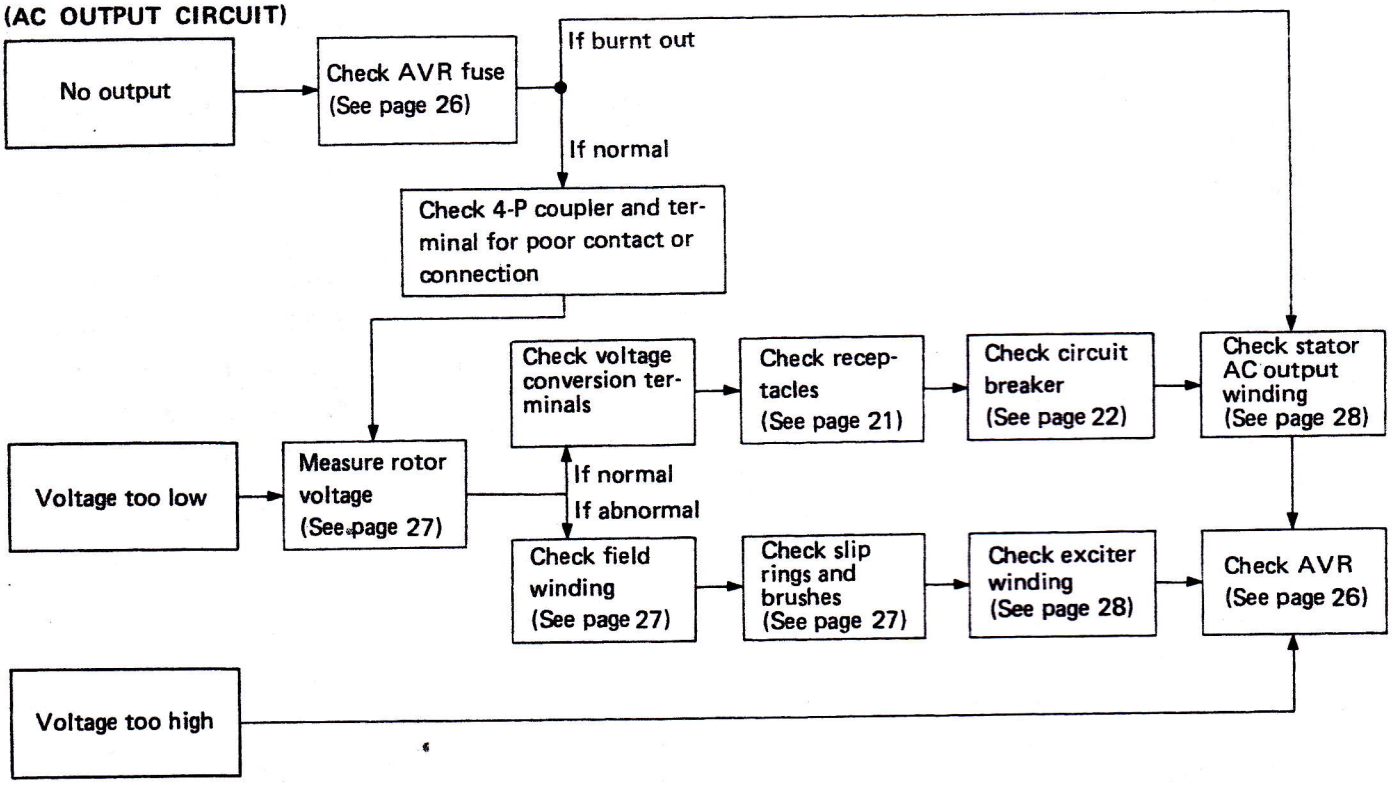
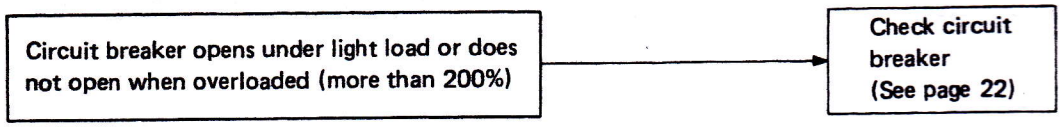
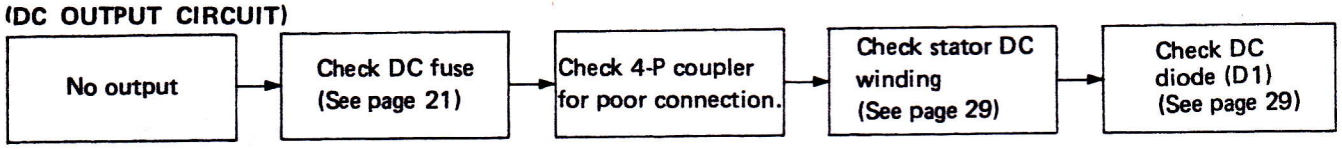
5. TROUBLESHOOTING

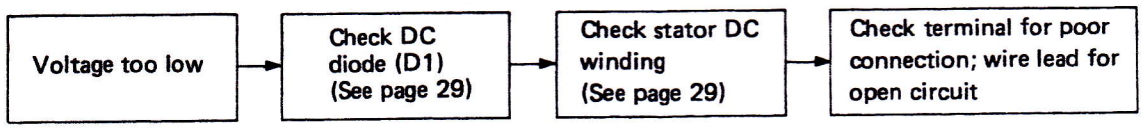
(AC OUTPUT CIRCUIT)

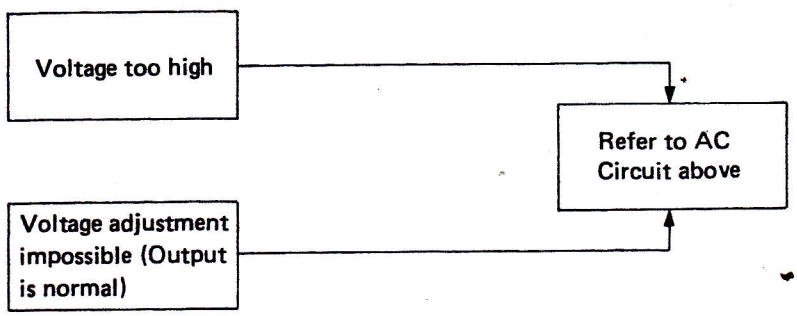

No output
Check AVR fuse (See page 26)
If burnt out
If normal
Check 4-P coupler and terminal for poor contact or connection
Check voltage conversion terminals
Check receptacles (See page 21)
Check circuit breaker (See page 22)
Check stator AC output winding (See page 28)
Voltage too low
Measure rotor voltage (See page 27)
If normal
If abnormal
Check field winding (See page 27)
Check slip rings and brushes (See page 27)
Check exciter winding (See page 28)
Check AVR (See page 26)
Voltage too high



(DC OUTPUT CIRCUIT)


No output
Check DC fuse (See page 21)
Check 4-P coupler for poor connection.
Check stator DC winding (See page 29)
Check DC diode (D1) (See page 29)


Voltage too low
Check DC diode (D1) (See page 29)
Check stator DC winding (See page 29)
Check terminal for poor connection; wire lead for open circuit



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6. MAINTENANCE SCHEDULE

Periodic maintenance is an important factor in keeping the generator in the best operating condition.
Service the unit in accordance with the maintenance schedule below.

CAUTION

Use only new genuine HONDA parts or their equivalent.
The use of replacement parts which are not of equivalent quality may damage the engine.

Regular Service Period: Perform at every indicated month or operating hour intervals, whichever comes first. / Item		Daily	First month or 20 Hrs.	Every 3 months or 50 Hrs.	Every 6 months or 150 Hrs.	Every year or 300 Hrs.
Engine oil	Check	○				
Engine oil	Change		○		○	
Air cleaner element	Check	○				
Air cleaner element	Clean			○ *		
Fuel filter	Clean				○	
Spark plug	Clean-Adjust				○	
Drive belt	Adjust				○	
Spark arrester (K1 only)	Clean				○ (Every 100 Hrs.)	
Ignition timing	Check-Adjust					○
Valve clearance	Check-Adjust					○
Combustion chamber	Clean-Lap valves					○
Fuel tank	Clean					○
Fuel line	Check (Replace, if necessary)					○

* Service more frequently when used in dusty areas.

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III. UNIT REMOVAL

The chart on the next page shows the parts which must be removed in order to remove each of the major units; Control Box, Generator and Engine.
When removing a unit, proceed down the "Parts To Be Removed" list in the order shown.
The illustrations on the next page are numbered to match the job numbers.
Torques for the fasteners are listed on page 13.

NOTE

To install, reverse the removal procedure.

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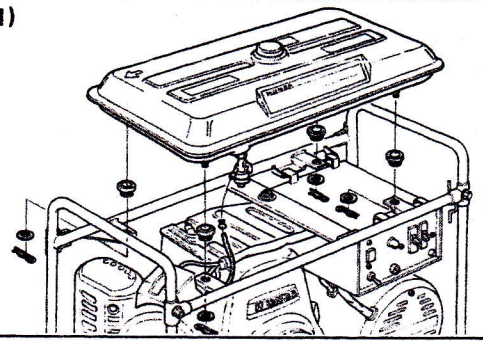
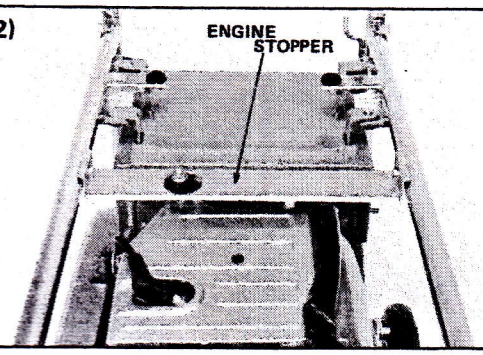
JOB NO.	PARTS TO BE REMOVED	TO REMOVE THE		
		CONTROL BOX	GENE-RATOR	ENGINE
1	FUEL TANK	○		○
2	ENGINE STOPPER (K1 only)	○		○
3	WIRE PROTECTOR TUBE AND COUPLERS	○		○
4	WIRE PROTECTOR CAP AND COUPLERS	○		○
5	4-P COUPLER	○	○	
6	GENERATOR END COVER	○	○	
7	AC OUTPUT TERMINALS	○	○	
8	BELT COVER		○	○
9	STARTER MOTOR TER-MINALS (ES3500 only)	○		○
10	CONTROL BOX MOUNT-ING PINS	○		
11	GENERATOR ADJUSTING AND MOUNTING BOLTS		○	(Loosen) ○
12	DRIVE BELT		○	○
13	GENERATOR STAY		○	○
14	ENGINE MOUNTING BOLTS			○

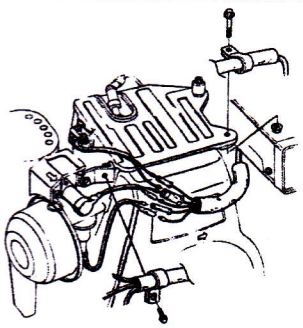
(1)



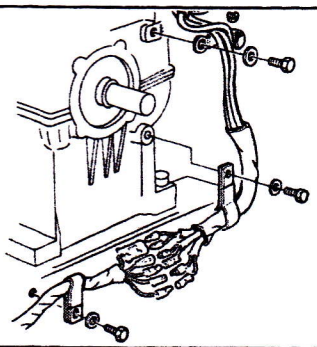
(2)



(3) K1



(3) K0



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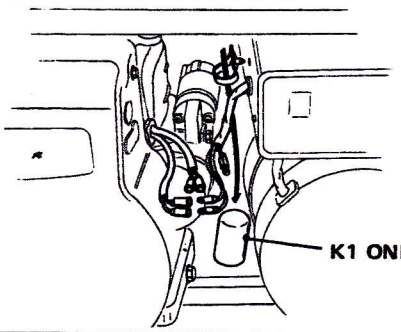

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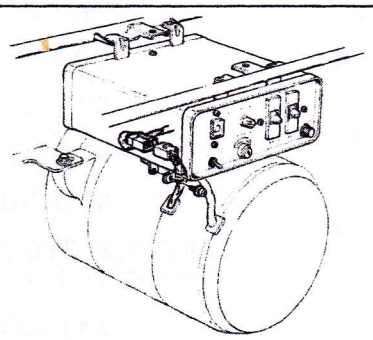
(5)



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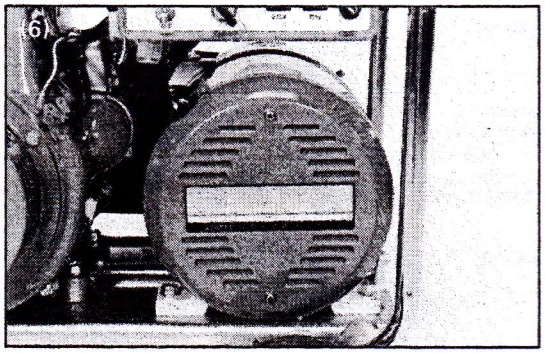

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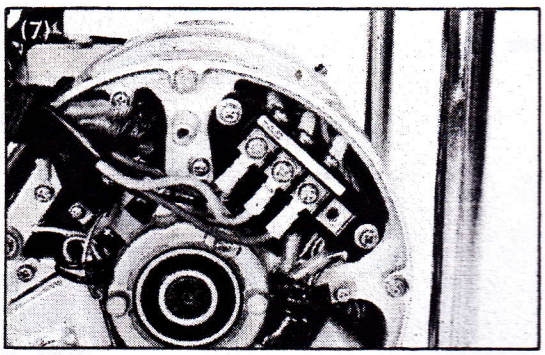

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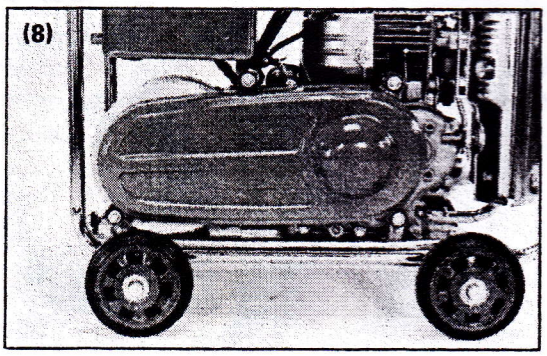

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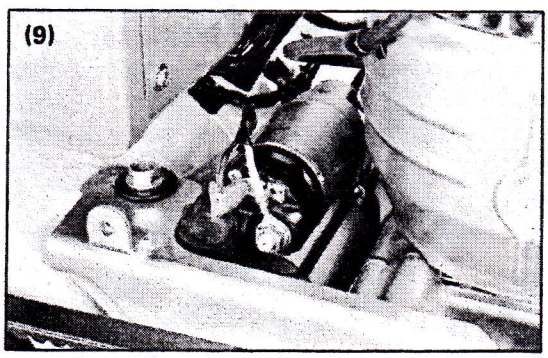

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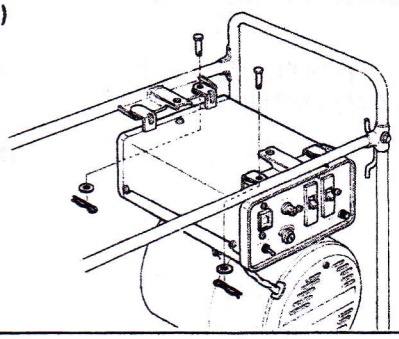

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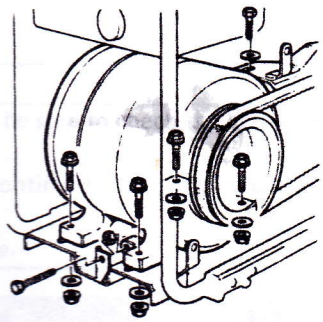

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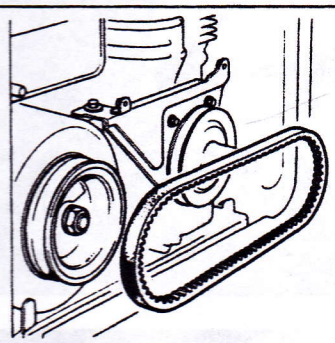

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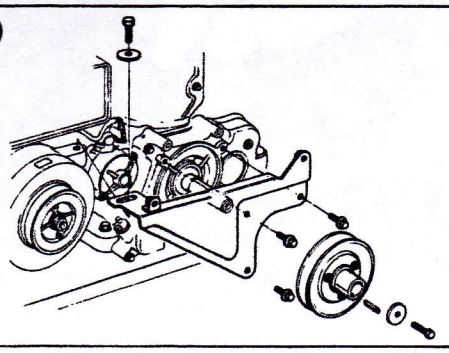

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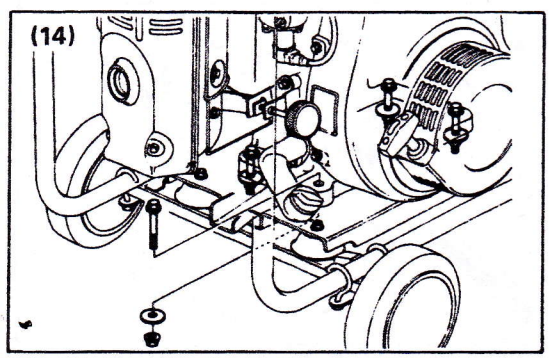

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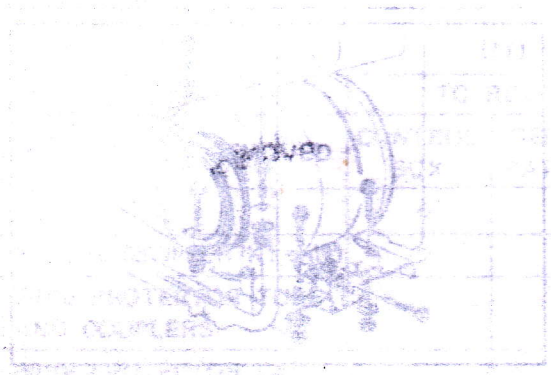

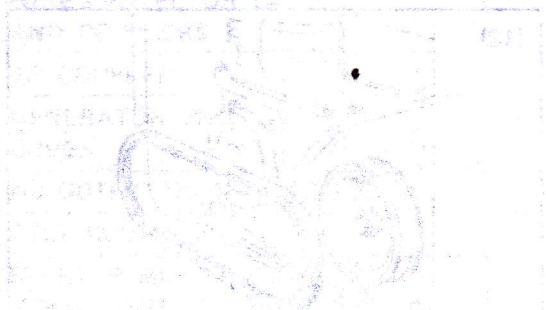

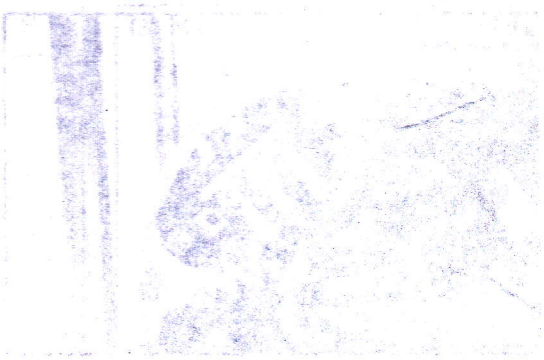

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Ⅳ. INSPECTION

1. PILOT LAMP
2. FUSE (DC)
3. RECEPTACLE
4. CIRCUIT BREAKER
5. ENGINE SWITCH
6. REMOTE CONTROL SWITCH [ES3500]
7. FREQUENCY METER
8. R1 AND R2 RECTIFIERS
9. R2 RECTIFIER
10. FUEL CUT-OFF SOLENOID VALVE
11. AUTOMATIC CHOKE SOLENOID
12. AVR
13. CARBON BRUSH AND SLIP RING
14. FIELD WINDING (FW)
15. EXCITER WINDING (EW)
16. AC OUTPUT WINDING (MW)
17. DC OUTPUT WINDING (DCW)
18. DC DIODES (D1)
19. REPLACEMENT OF ROTOR AND STATOR

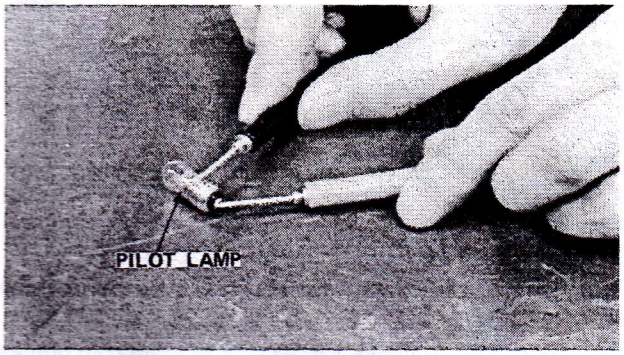
NOTE:

* Before inspecting any generator, control box or engine electrical component, be sure to check the terminals or couplers for looseness.
* After the individual component inspection, also inspect the wire leads for continuity; that might be the cause of the problem.
* Always warm up the engine for at least 30 minutes before measuring resistance.

1. PILOT LAMP

Remove the lens and pilot lamp from the lamp holder and check for continuity using an ohmmeter.

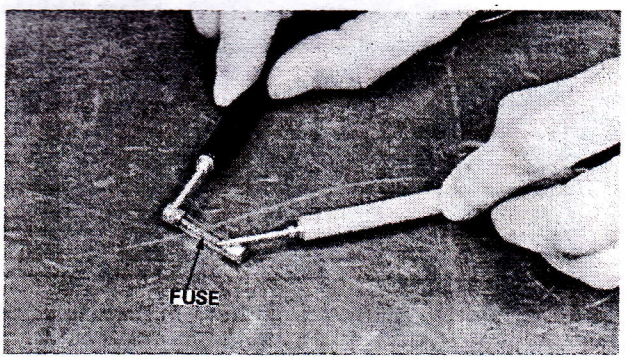
Specified lamp	24V-2W



2. FUSE (DC)

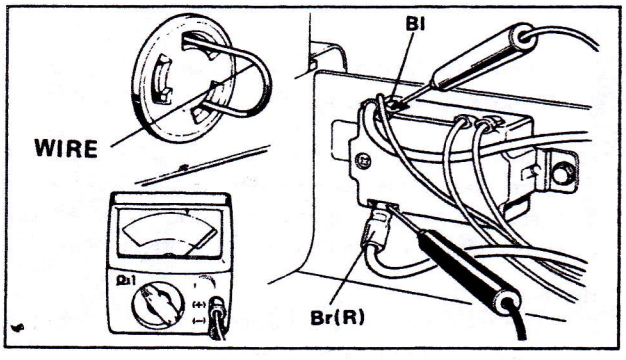
Stop the engine before removing the fuse.
Remove the fuse from the fuse holder and check for continuity using an ohmmeter. If continuity does not exist, replace the fuse with a new one.

Specified fuse	15A



3. RECEPTACLE

(1) Remove the control box. (See page 18)
(2) Remove the control box cover by removing the six 4 mm screws.
(3) Turn off the corresponding circuit breaker.
(4) Connect the terminals of the receptacle with a piece of wire and check for continuity between the terminals. If there is no continuity, the receptacle is defective, and must be replaced.



Replacement:
To replace the receptacle, remove the two 4 mm screws and disconnect each wire lead at the terminal.

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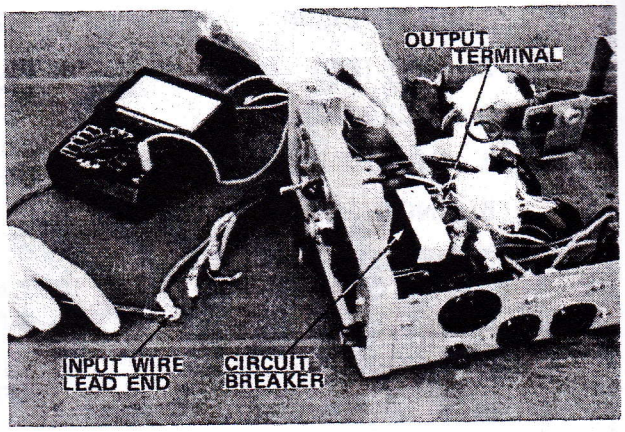
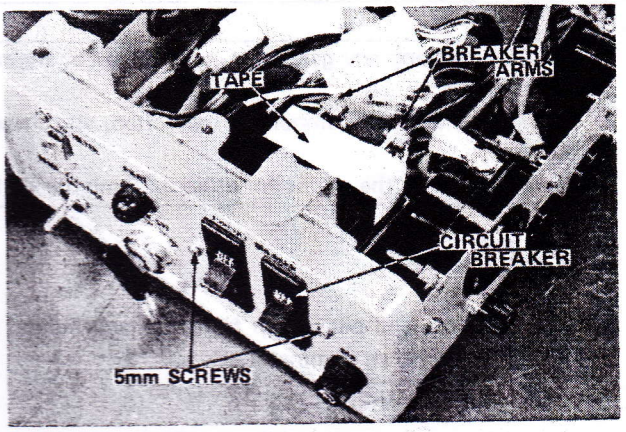
4. CIRCUIT BREAKER

(1) Remove the control box. (See page 18)
(2) Remove the six 4 mm screws and take off the box cover.
(3) With the breaker switch ON, check for continuity between the breaker output terminal and its input wire lead end (the same color).



Replacement:
Remove the two 5 mm screws and disconnect the wire leads. The breaker can then be taken out. After installing a new breaker, secure the breaker arms with tape as shown.

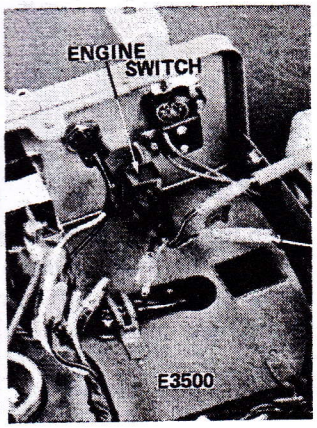


5. ENGINE SWITCH

(1) Remove the control box. (See Page 18)
(2) Remove the cover from the box by loosening the six 4 mm screws.
(3) [ES3500] Remove the 8-P coupler. Using an ohmmeter, check for continuity with the ignition key in each position in accordance with the chart below.

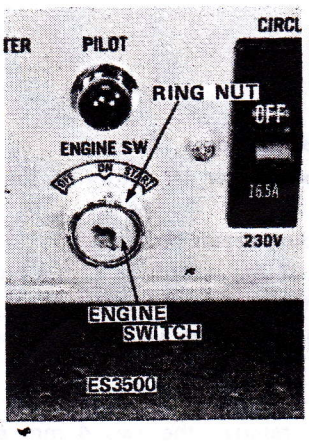
Wire color / Key position	B/Y	B	W	B/W	Lg	Y	R	Gr/W
OFF	○—○						○—○	
ON			○—	——	—○			
START			○—	—○—	—○—	—○		

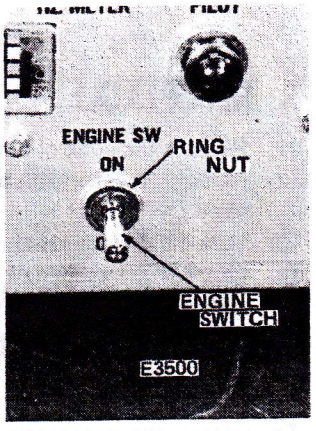
The switch is normal if there is continuity between the markings (○—○) in all positions. Replace the switch if no continuity exists between the markings.



Replacement:
a. Remove the ignition key and loosen the ring nut.
b. Remove the 8-P coupler, then take out the switch.

(4) [E3500] Disconnect the engine switch connectors. Using an ohmmeter, check for continuity between the black/yellow and black as well as the green/white and red/white wire leads with the switch OFF. If no continuity exists, replace the switch.





Replacement:
a. Remove the ring nut and disconnect the connectors.
b. The switch can now be taken out.

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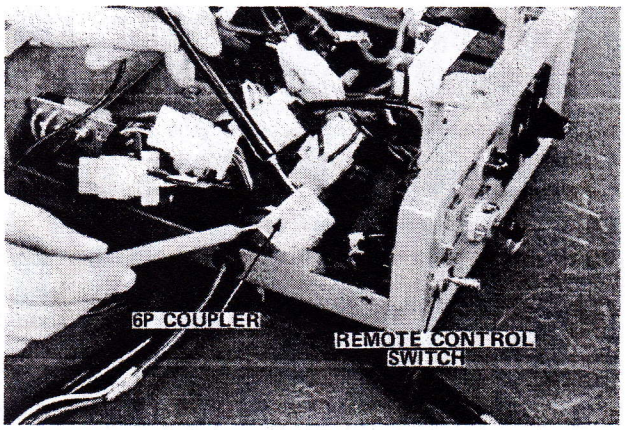
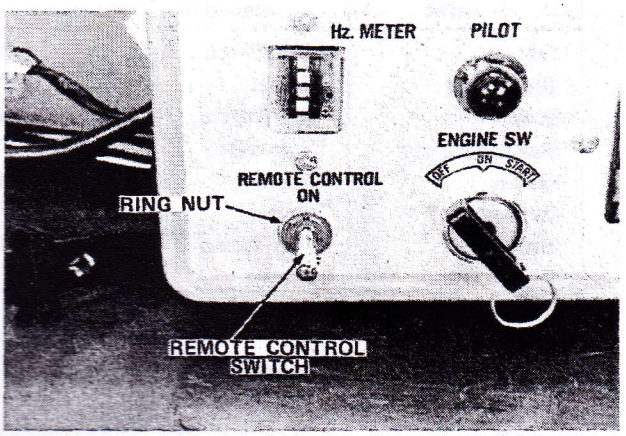
6. REMOTE CONTROL SWITCH (ES3500)

(1) Remove the control box. (See page 18)
(2) Remove the cover from the box by loosening the six 4 mm screws.
(3) Disconnect the 6-P coupler.
(4) The switch is normal if there is continuity between the markings (o—o) in all positions.

	R	R/W	R/B	W/Gr	W	W/B
OFF	o	——	o	o	——	o
ON		o	——	o		——



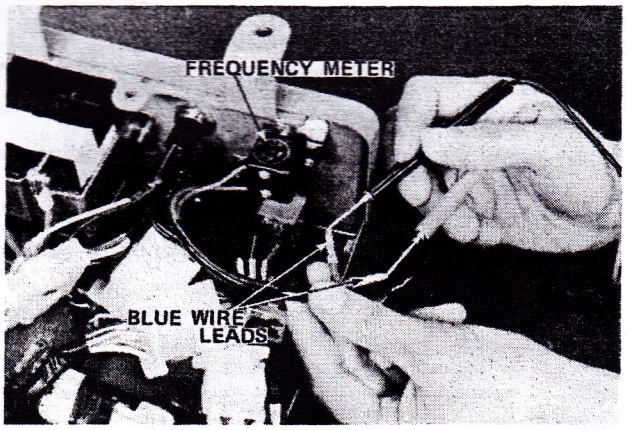
Replacement:
Back off the ring nut and take out the switch.



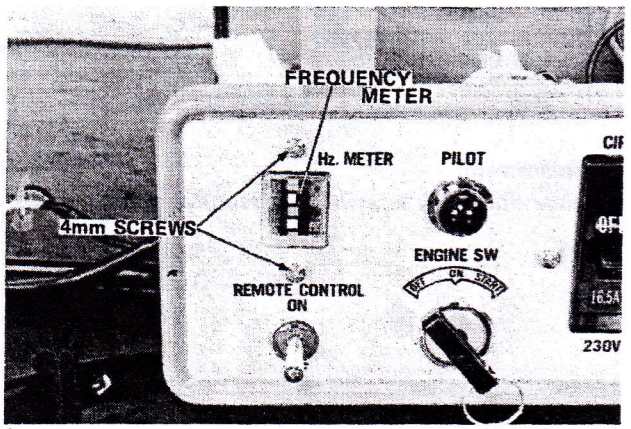
7. FREQUENCY METER

(1) Remove the control box. (See page 18)
(2) Remove the cover from the box by loosening the six 4 mm screws.
(3) Disconnect the frequency meter connectors.
(4) Check for continuity between the two blue wire leads using an ohmmeter.
(5) Replace the meter if no continuity exists.

SPECIFIED RESISTANCE	64Ω



Replacement:
Loosen the two 4 mm screws securing the meter bracket.



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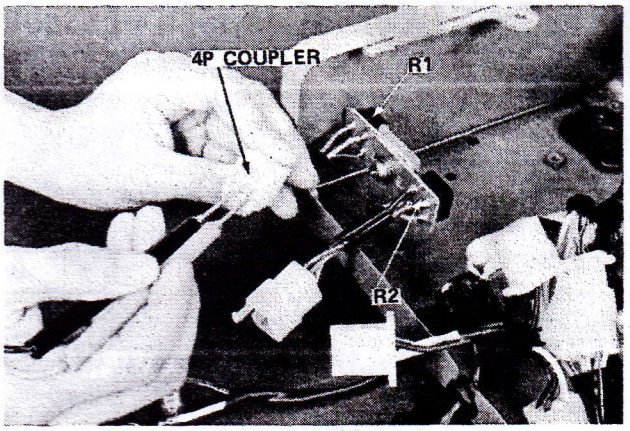
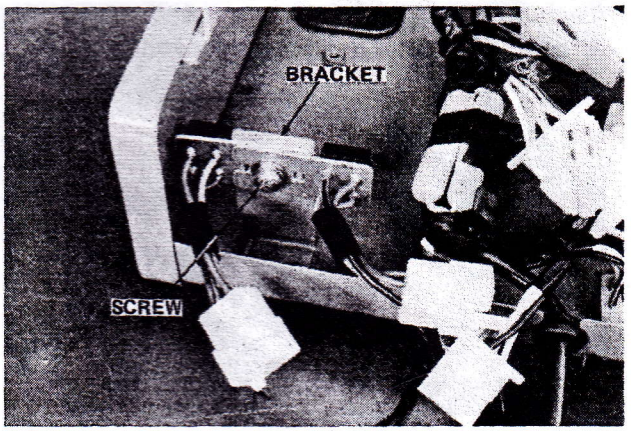
8. R1 (FOR FUEL-CUT SOLENOID) AND R2 (FOR ES3500K1 STARTING CIRCUIT) RECTIFIERS

(1) Remove the control box. (See page 18)
(2) Remove the cover from the box by loosening the six 4 mm screws.
(3) Disconnect the coupler from the rectifier.
(4) Using an ohmmeter, check for continuity according to the chart below.
(5) If there is no continuity where there should be, or if continuity exists in all cases, replace the rectifier.

Ohmmeter probe		Continuity
Positive	Negative	
Green	Black/Red	NO
Black/Red	Green	YES
Black/Red	Red/White	NO
Red/White	Black/Red	YES
Green	Brown	NO
Brown	Green	YES
Brown	Red/White	NO
Red/White	Brown	YES

Replacement:
Loosen the screw securing the rectifier to the bracket.



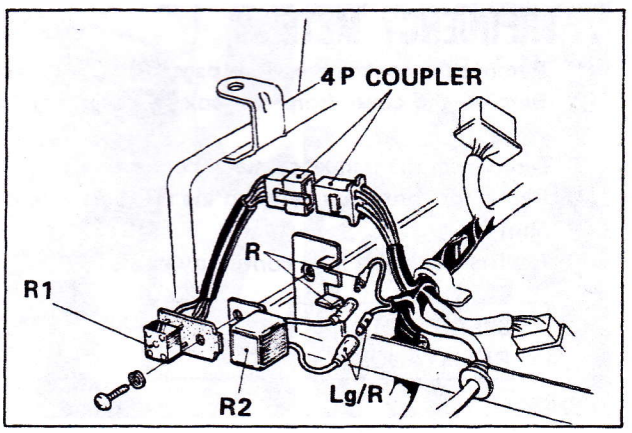


9. R2 RECTIFIER (ES3500K0) (FOR STARTING CIRCUIT)

(1) Remove the control box. (See page 18)
(2) Remove the cover from the box by loosening the six 4 mm screws.
(3) Disconnect the rectifier connectors.
(4) Using an ohmmeter, check for continuity according to the chart below.
(5) If there is no continuity, or if continuity exists both ways, replace the rectifier.

Ohmmeter probe		Continuity
Positive	Negative	
Light green/Red	Red	NO
Red	Light green/Red	YES

Replacement:
Loosen the screw securing both rectifiers to the bracket.



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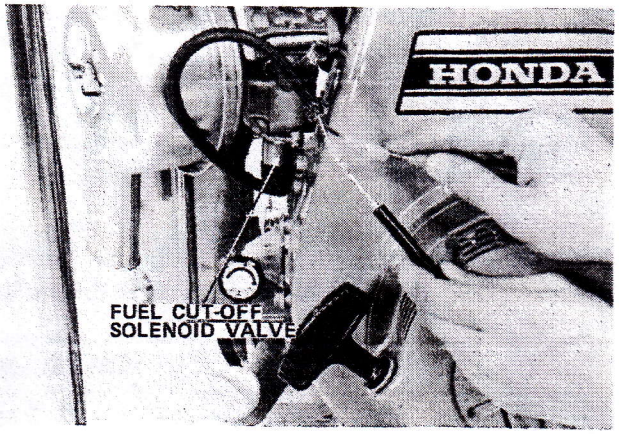
10. FUEL CUT-OFF SOLENOID VALVE

(1) Remove the fuel tank, engine stopper and wire protector tube (See page 18) (K1 only) and disconnect the solenoid valve connectors.
(2) Using an ohmmeter, check for continuity between the two wire leads.
(3) Replace the solenoid valve if there is no continuity.

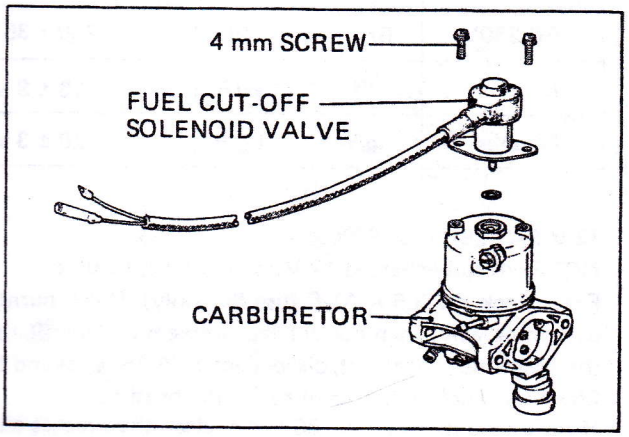


Replacement:

WARNING

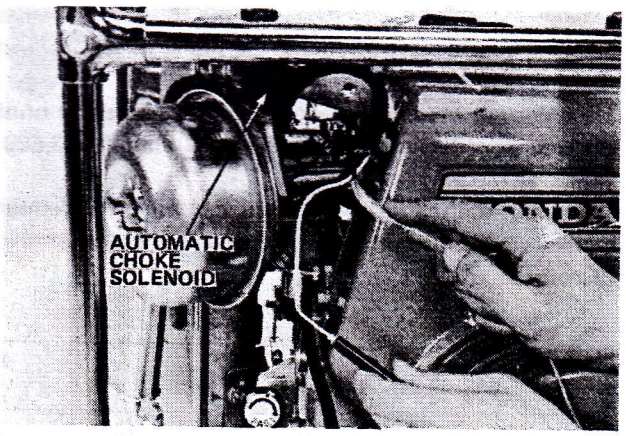
Before removing the solenoid, turn the fuel valve off and drain the carburetor completely by loosening the drain screw.

a. Loosen the governor arm attaching nut and remove the arm from the governor arm shaft.
b. Remove the air cleaner and automatic choke bracket. (See page 18)
c. Remove the carburetor with the governor arm, rod and spring connected.
d. Loosen the two 4 mm screws, then remove the solenoid valve.
e. Reassemble by reversing the removal procedures: however, pay attention to the following.
   (a) Replace the O-ring between the solenoid and float chamber attaching bolt.
   (b) Tighten the screws securely and check to be sure that there are no fuel leaks.



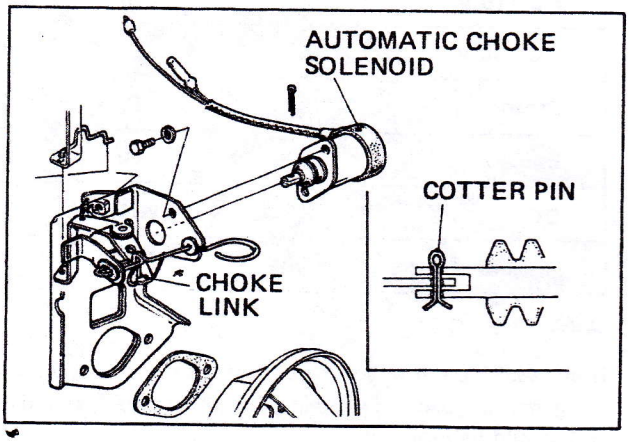
11. AUTOMATIC CHOKE SOLENOID (ES3500)

(1) Remove the fuel tank, engine stopper, and wire protector tube (See page 18) (K1 only), and disconnect the solenoid connectors.
(2) Using an ohmmeter, check for continuity between the two wire leads.
(3) Replace the solenoid if there is no continuity.



Replacement:

a. Remove the air cleaner and choke linkage cover.
b. Remove the cotter pin connecting the choke link and solenoid rod.
c. Loosen the two 4 mm bolts and remove the solenoid with the boot attached.
d. Reassemble by reversing the removal procedures: however, pay attention to the following.
   (a) Before replacing, install the boot properly.
   (b) Insert the cotter pin through the holes in the choke link and solenoid rod and spread its end properly.



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12. AVR

The following procedures are designed to expose a faulty AVR by first eliminating other possibly faulty components of the AC circuit.
While there are individual inspections for the components, these steps will test parts as they relate to the funciton of the generator as a whole.

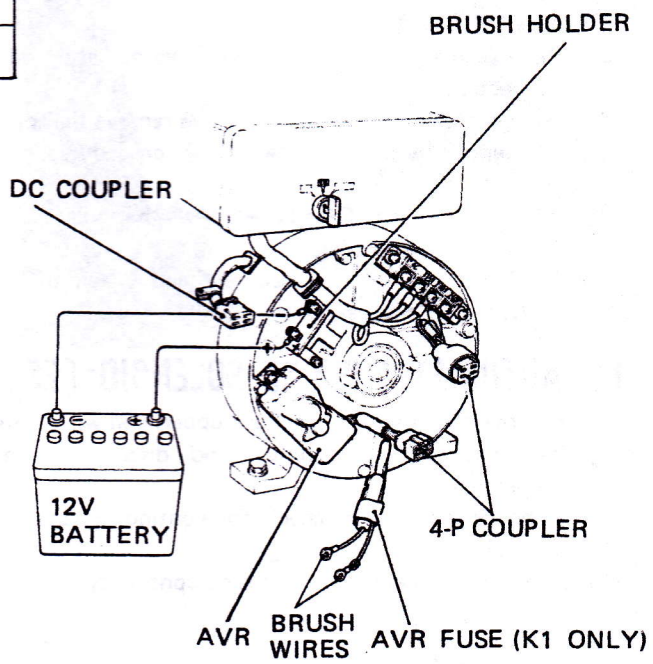
NORMAL OPERATION CHECK

First test the generator's performance under normal conditions. Remove the generator end cover.
With all wires connected and the generator running at 3,600 rpm, voltages should be —

COIL	COLOR		NORMAL OPERATION
AC 115V	R	Bl	120 ± 18 V AC
AC 230V	Br	Bl	230 ± 35 V AC
DC	B/R	W/R	18 ± 3 V DC
Brushes	Lg/W	Lg/B	20 ± 3 V DC

12 V BATTERY CHECK

NOTE: A fully-charged 12 V battery must be used.
First check the 3.5 A AVR fuse (K1 only). If it is burnt out, try to determine why; then correct the problem and install a new fuse. If the fuse is not burnt out, disconnect all AVR wires and brush wires. Check field coil resistance through the brushes.
If resistance is more than 50 ohms, clean the brushes and slip rings; measure brush length. Replace the brushes if necessary. Then recheck resistance, this time at the slip rings too. If resistance is too low, replace the rotor.
If resistance is OK, hook a 12 V battery across the brushes and run the engine at the rated speed; K1:3,100 rpm, K0: 3,500 rpm.
Measure coil voltages.
Assuming that the rotor is in good condition (no damaged slip ring) readings should be as listed below, or the problem can be identified:



COIL	COLOR		SPECIFIED VOLTAGE	MEASURED VOLTAGE	FAULTY COMPONENT : REPLACE
AC 115 V	R	Bl	80 ± 12 V AC	Low	Stator
AC 230 V	Br	Bl	190 ± 29 V AC	Low	Stator
Sensor	Lg	Bl	14 ± 2 V AC	Low or High	Stator
Exciter	Lg/R	Gr	60 ± 9 V AC	Low	Stator
DC	B/R	W/R	14 ± 2 V DC	Low	Stator or Diodes
Brushes	Lg/W	Lg/B	12 ± 2 V DC	(BATTERY READING)	

AVR CHECK

If all results are low, the rotor is defective. Individual problems can be traced to the stator or diodes. If all results are good, put the generator back in normal operating condition and measure DC volts at the brushes. If voltage is low the regulator is at fault and should be replaced.

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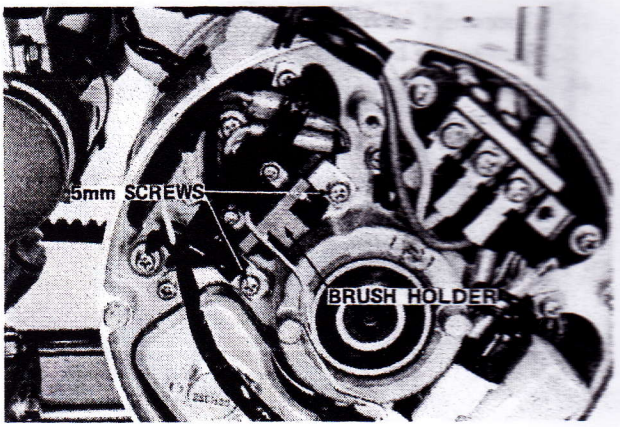
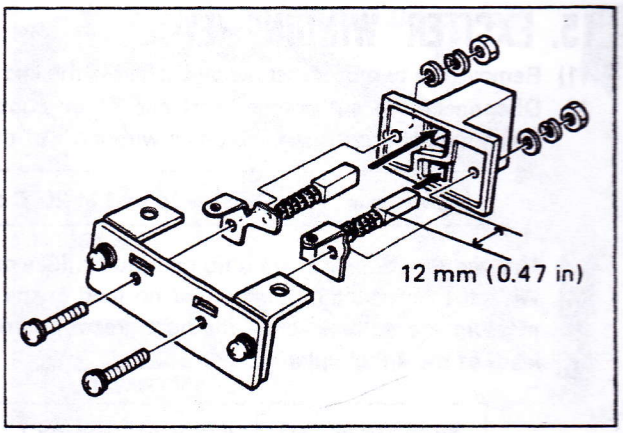
13. CARBON BRUSH AND SLIP RING

(1) Remove the two 5 mm screws securing the end cover; take off the cover.
(2) Disconnect the wire leads from the brush holder.
(3) Unscrew the two 5 mm screws and take out the brush holder.



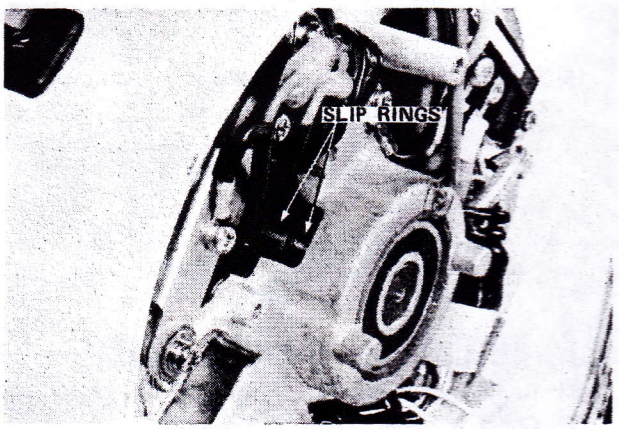
(4) Disassemble the brush holder. Brushes that are worn down to 12 mm (0.47 in) should be replaced.
(5) Install the brushes into the holder and make sure the brushes move smoothly.



NOTE:

- Connect the wire lead with the (+) mark to the positive (+) side of the brush holder.
- Avoid damaging the brushes when removing and installing the brush holder.

(6) Visually inspect the slip rings for freedom from dust, rust or other damage. If necessary, wipe them with a clean lint-free cloth. If they are rusted or damaged, remove the rotor and dress with fine emery cloth (No. 500 – 600).



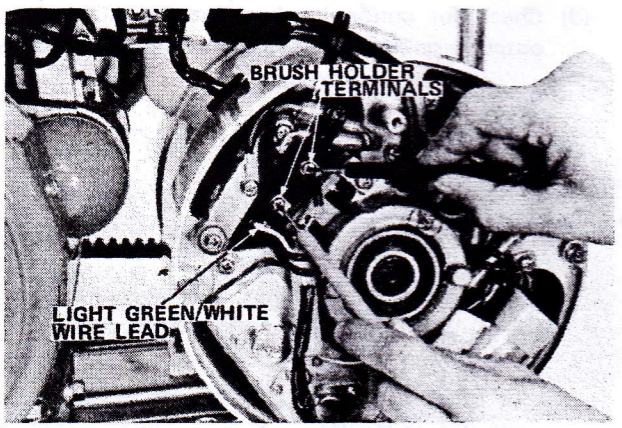
14. FIELD WINDING (FW)

(1) Remove the two 5 mm screws and take off the end cover.
(2) With the generator running at the rated speed, measure the voltage across the brush holder terminals.

Specified voltage	20V DC (approx.)

NOTE:

Take note of the polarity of the tester probes and wire leads. Connect the positive (+) probe to the positive (+) side terminal (light green/white wire lead) of the brush holder.



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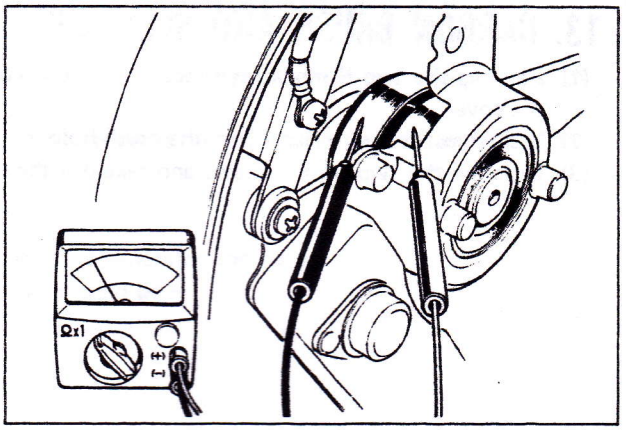
(3) Disconnect each wire lead and remove the two 5 mm screws. Remove the brush holder.
(4) Using an ohmmeter, measure the resistance between the slip rings.

Specified resistance	50 Ω (approx.) at 20°C or 68° F

(5) Replace the rotor (See page 29) if the resistance is zero (0) or if there is no continuity.



15. EXCITER WINDING (EW)

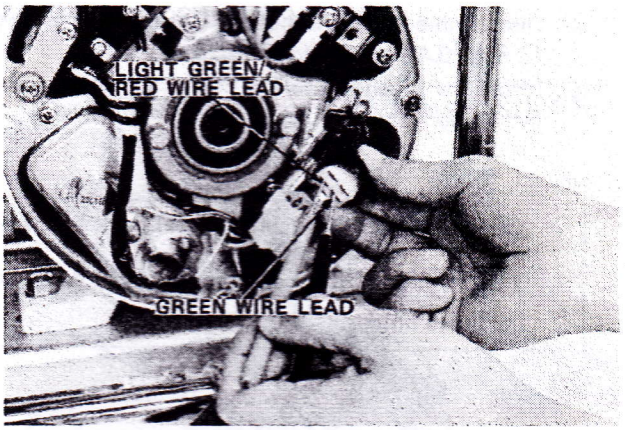
(1) Remove the two 5mm screws and take off the end cover.
(2) Disconnect the 4-P coupler and check for continuity be - tween the light green/red and green wire leads of the coupler.

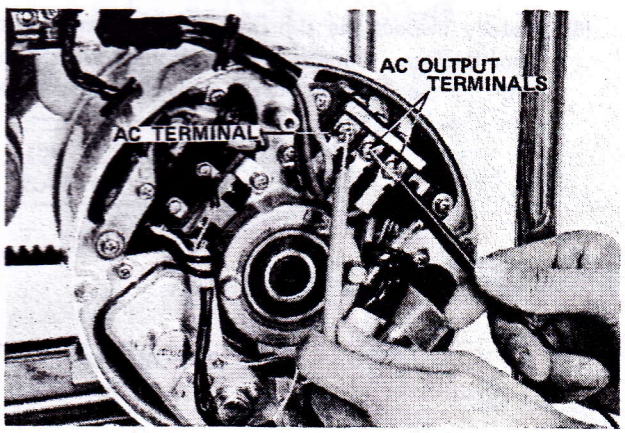
Resistance	1.5Ω (approx.) at 20°C or 68°F

(3) Replace the stator if there is no continuity. (See page 29)
(4) With the generator running under no load at the rated speed, measure the voltage across the light green/red and green wire leads of the 4-P coupler.

Specified voltage	4~6V AC (approx.)

(5) Replace the stator with a new one if the voltage is below the specified limits.





16. AC OUTPUT WINDING (MW)

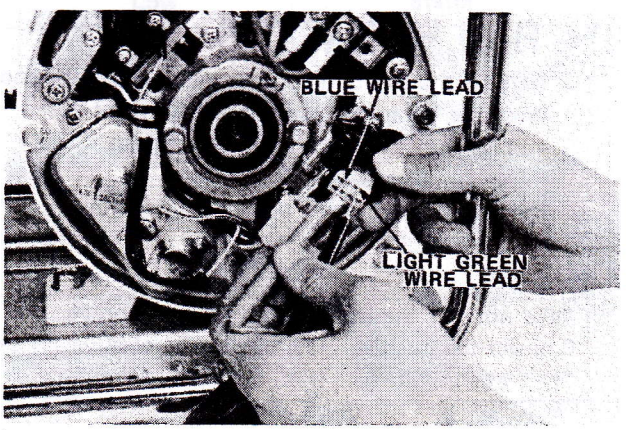
(1) Remove the 5 mm screws and take off the end cover.
(2) Check terminal screws for looseness.
(3) Check for continuity between the AC and respective AC output terminals of the voltage conversion terminals.

AC output voltage	115V	230V
Resistance (approx.) at 20°C or 68° F	0.3 Ω	1.13 Ω

(4) Replace the stator if there is no continuity. (See page 29)

(5) Disconnect the 4-P coupler. Check for continuity between the light green and blue wire leads. Replace the stator if there is no continuity.

Specified resistance	0.12 Ω (approx.) at 20°C or 68° F



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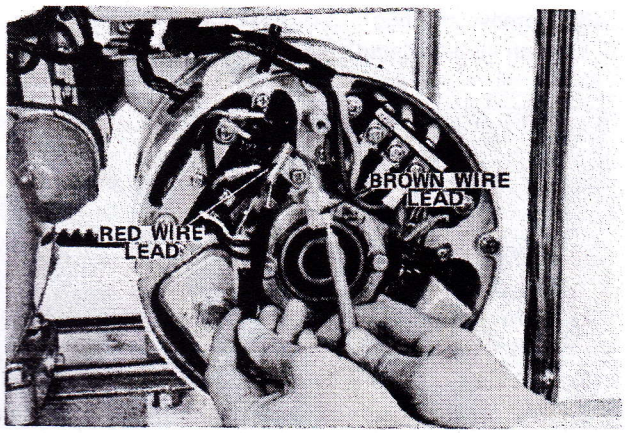
17. DC OUTPUT WINDING (DCW)

(1) Remove the two 5 mm screws and take off the end cover.
(2) Disconnect the brown and red wire leads of the DC output winding at the connector and check for continuity between them.

Specified resistance	0.8Ω (approx.) at 20°C or 68°F

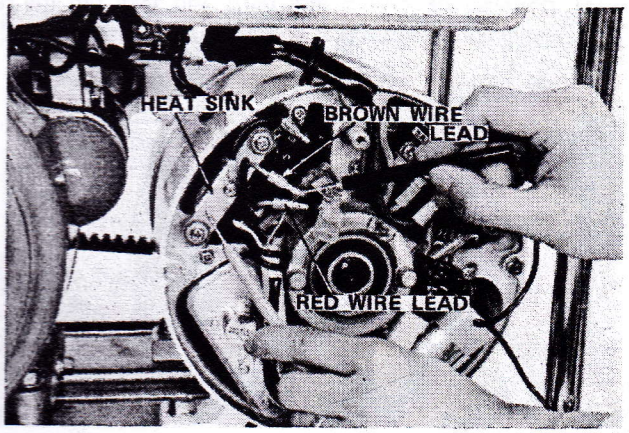
(3) Replace the stator if there is no continuity.



18. DC DIODES (D1)

(1) Remove the two 5 mm screws and take off the end cover.
(2) Disconnect the brown and red diode leads. With an ohmmeter in the R x 1 range, check for continuity between both leads and the heat sink.

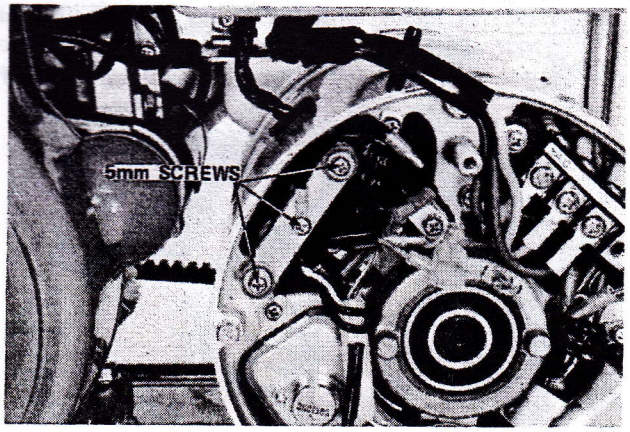
Polarity of test probe	+	Heat sink	Brown
	–	Brown	Heat sink
Continuity		YES	NO
Polarity of test probe	+	Heat sink	Red
	–	Red	Heat sink
Continuity		YES	NO



Replacement:
Remove the three 5 mm screws and the diodes.

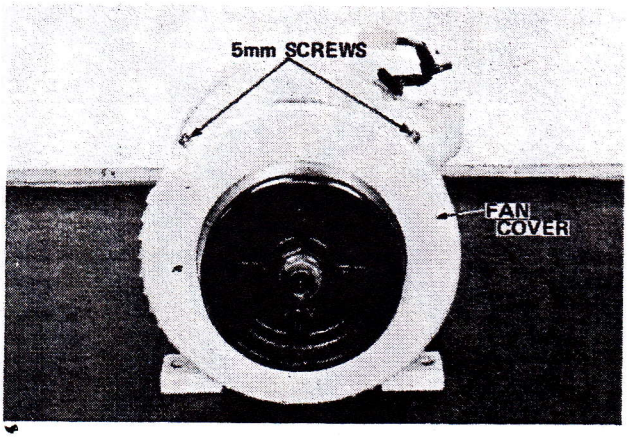
NOTE:

When reassembling, do not forget to install the insulators between the washers and the diode stay.



19. REPLACEMENT OF ROTOR AND STATOR

Disassembly:
(1) Remove the generator. (See page 18)
(2) Loosen the three 5 mm screws and remove the fan cover.



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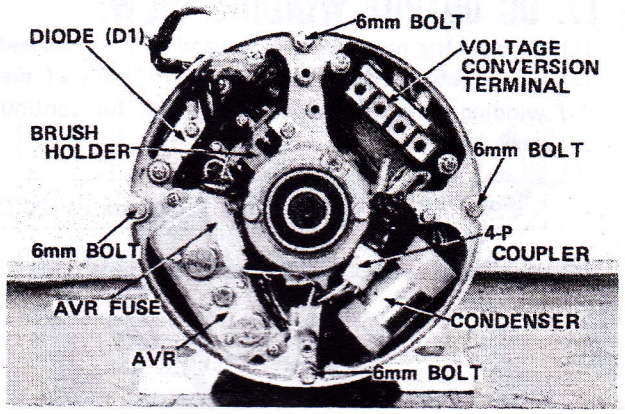
(3) Remove the two 5 mm screws and the end cover. Disconnect each wire lead and take out the brush holder.

NOTE:

> Avoid damaging the brushes when removing and installing the brush holder.

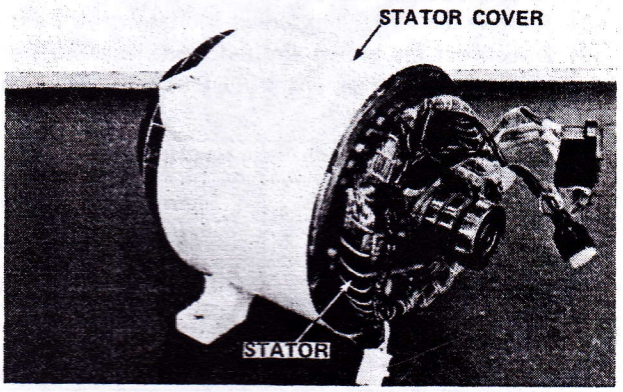


(4) Disconnect the wire leads running to the diode (D1) and ground.
(5) Remove the two 5 mm screws securing the voltage conversion terminal.
(6) Disconnect the 4-P coupler, remove the four 5 mm screws and take off the AVR and condenser with the fuse holder.
(7) Remove the four 6 mm bolts and take out the rear housing while lightly tapping it around with a soft hammer.

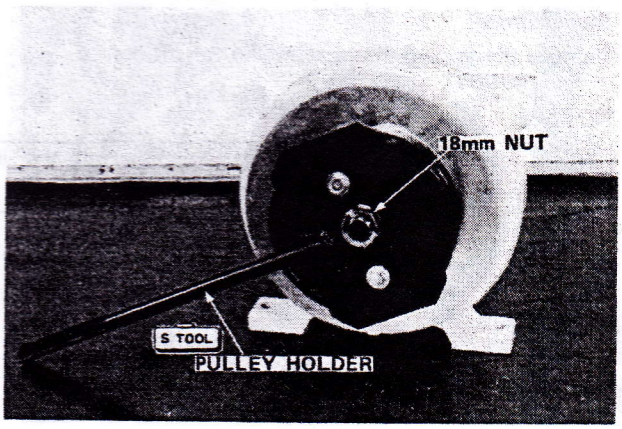
NOTE:

> Use care not to damage the rotor ball bearing.

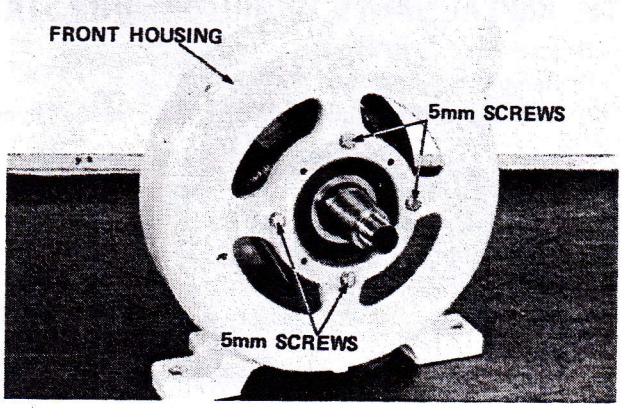
(8) Remove the stator cover and stator.



(9) Hold the pulley with the Pulley Holder (Special Tool No. 07925–8930000); loosen the 8 mm nut. Install the two 8 mm holder bolts and screw in until the pulley comes off the rotor.



(10) Remove the four 5 mm screws and remove the front housing.



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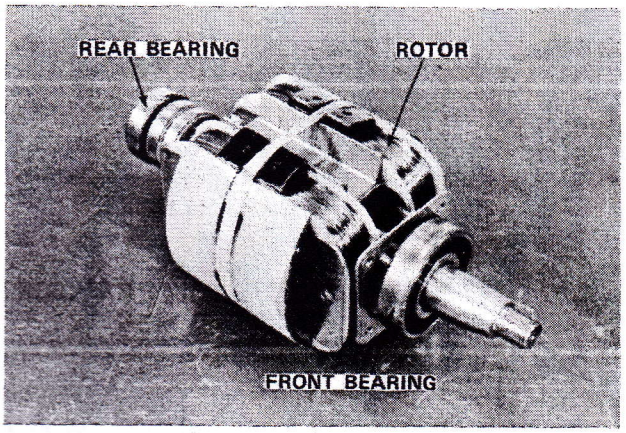
(11) Check the rotor front and rear bearings for excessive rattle and replace if necessary.



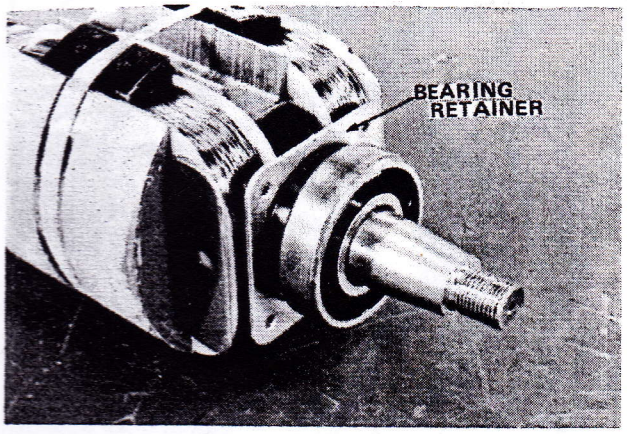
Assembly:

Assembly order is the reverse of removal. However, observe the following assembly notes:

(1) When driving the bearing, be sure to install the retainer. Use the Special Tool:

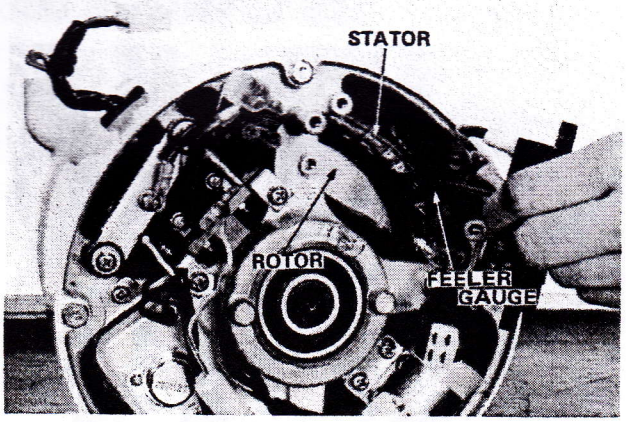
S. TOOL

Front bearing driver: No. 07945 – 7140000
(6306 V)



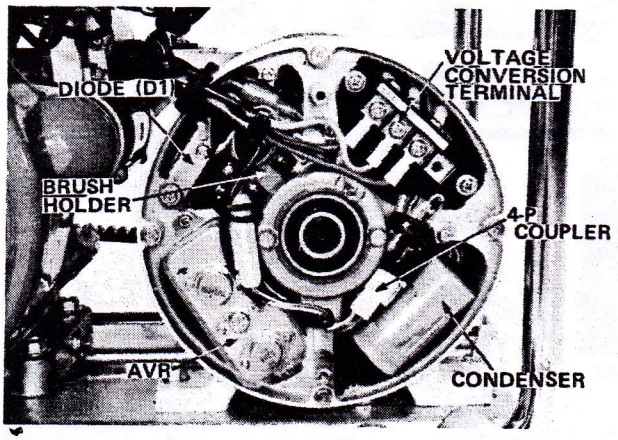
(2) After the rear housing has been installed, measure the clearance between the rotor and stator with a feeler gauge.

Specified air gap	**0.5 mm (0.020 in) on one side**



(4) Route each wire lead properly, making note of the polarity.

(5) Adjust the drive belt tension after assembly. (See page 34)



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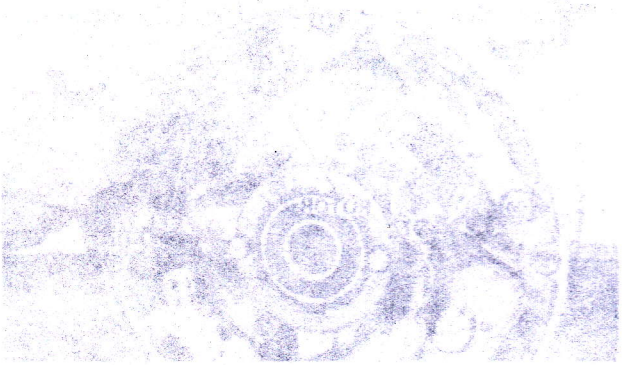

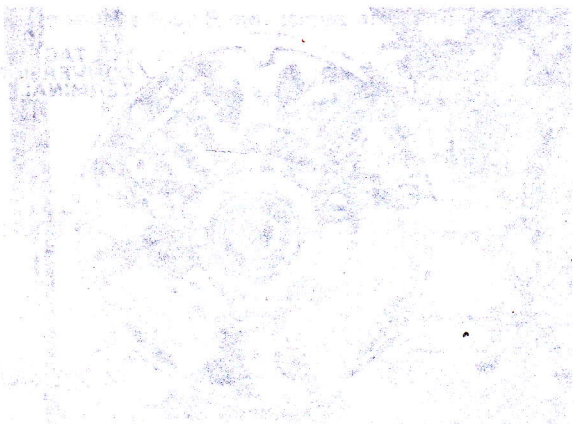

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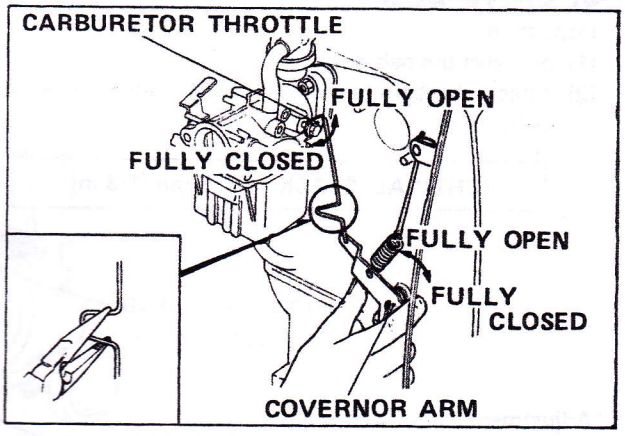
V. ADJUSTMENTS

1. GOVERNOR

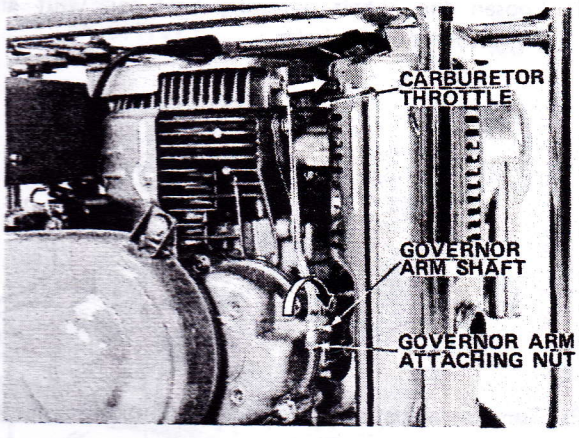
[E3500 K0/ES3500 K0]

(1) Rotate the governor arm clockwise (fully closed position).
(2) Make sure that the carburetor throttle valve is fully opened at this time.
(3) To adjust, bend or expand the V-shaped position of the governor rod.



[E3500 K1/ES3500 K1]

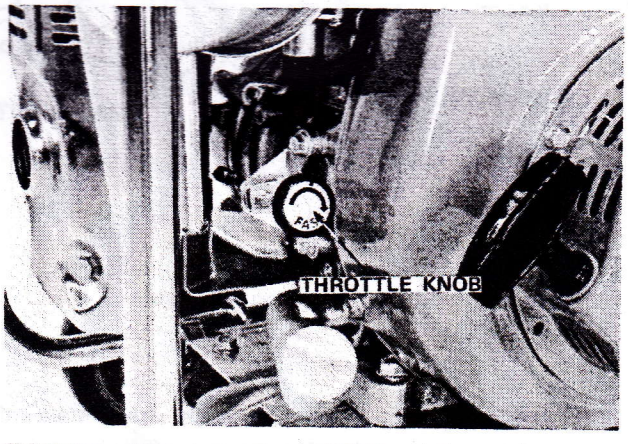
(1) Loosen the governor arm attaching bolt and nut.
(2) Turn the governor arm shaft counterclockwise (fully closed position) and tighten the bolt and nut with the throttle valve fully open.

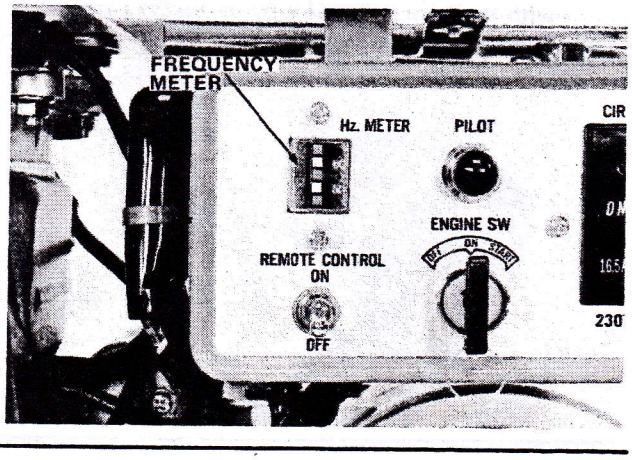


2. THROTTLE

(1) First measure the drive belt tension; adjust if necessary. (See page 34)
(2) Start the engine.
(3) Connect a load of 2.8 kW to the generator and allow it to warm up for 30 – 40 minutes.
(4) Turn the throttle knob either in or out as necessary until the rated frequency is reached.

Rated frequency	60 Hz





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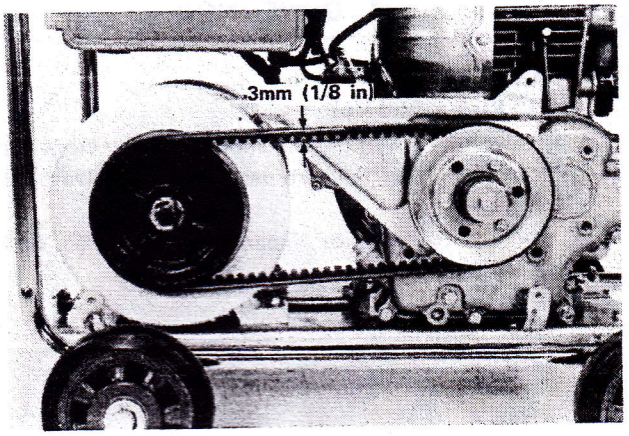
3. DRIVE BELT

Inspection:

(1) Remove the belt cover.

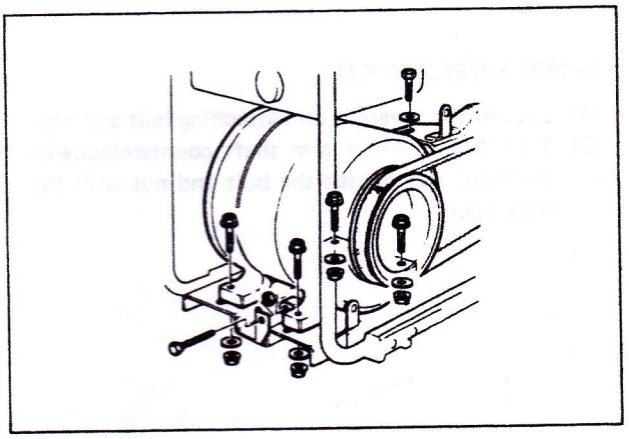
(2) Check the belt tension by pushing the middle portion of the belt.

VERTICAL SLACK	3 mm(1/8 in)

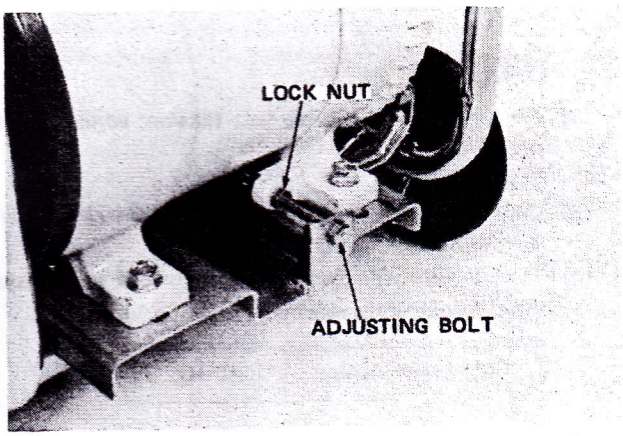


Adjustment:

(1) Loosen the V-belt adjusting bolt lock nut and the five generator mounting bolts.

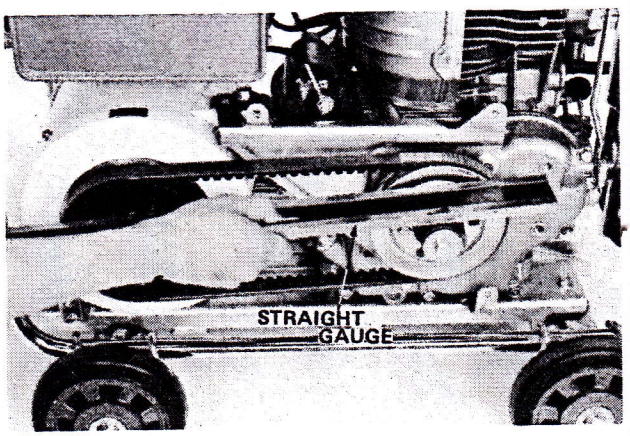


(2) Turn the adjusting bolt and move the generator to adjust belt tension.



(3) After adjustment, make sure the driven pulley face is flush with the drive pulley face by using a straight gauge.

(4) Tighten the generator mounting bolts and adjusting bolt lock nut securely.



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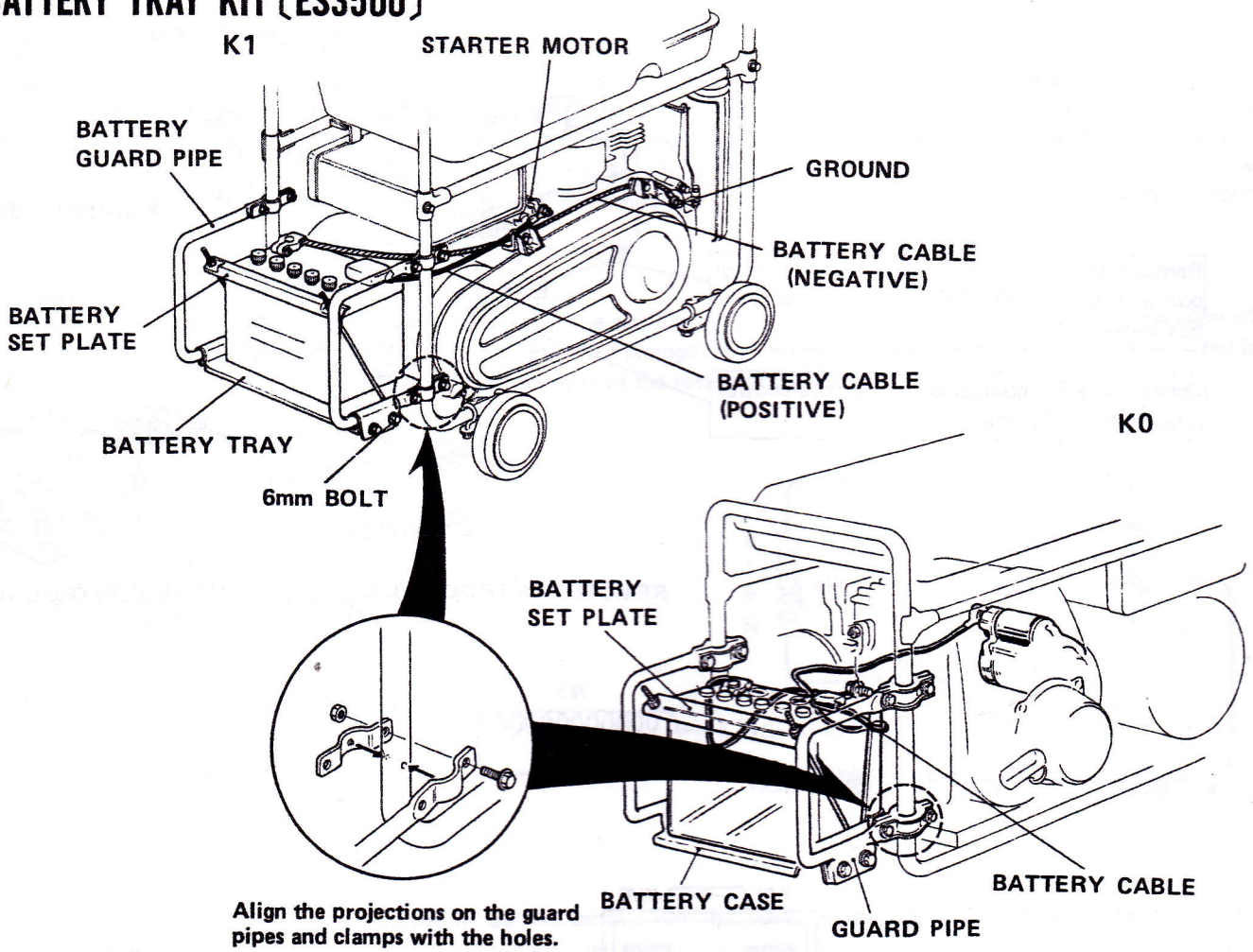
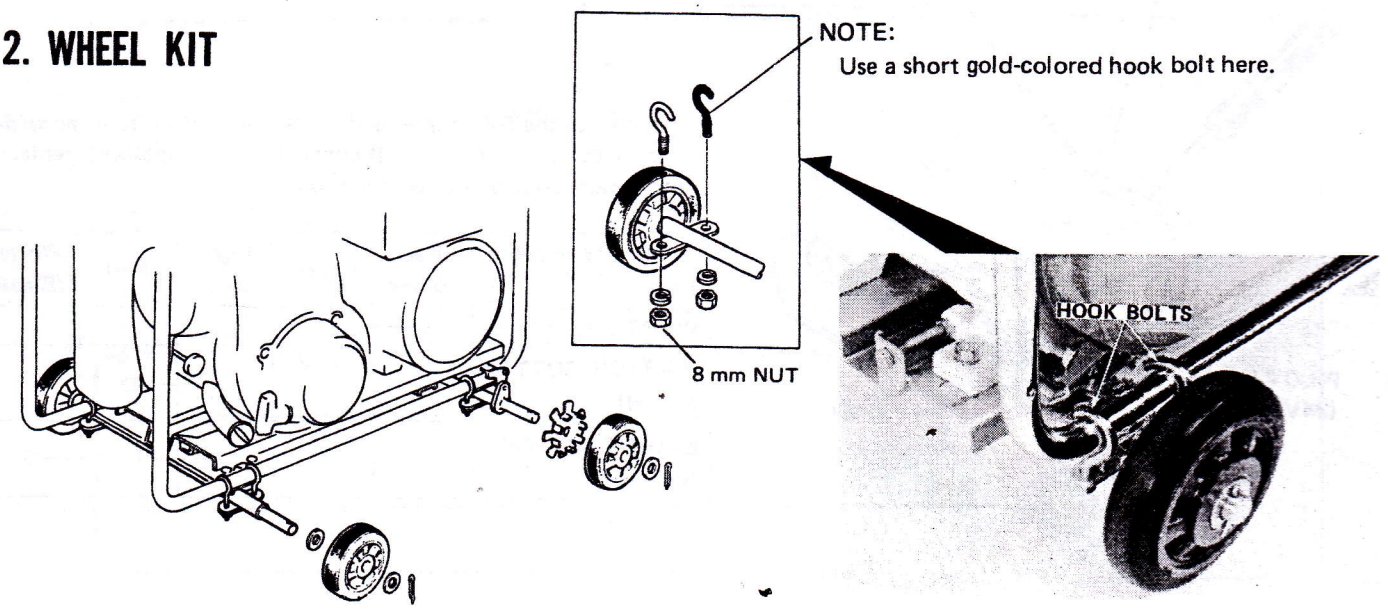
VI. OPTIONAL PARTS

1. BATTERY TRAY KIT | 2. WHEEL KIT | 3. REMOTE CONTROL KIT

1. BATTERY TRAY KIT (ES3500)



2. WHEEL KIT



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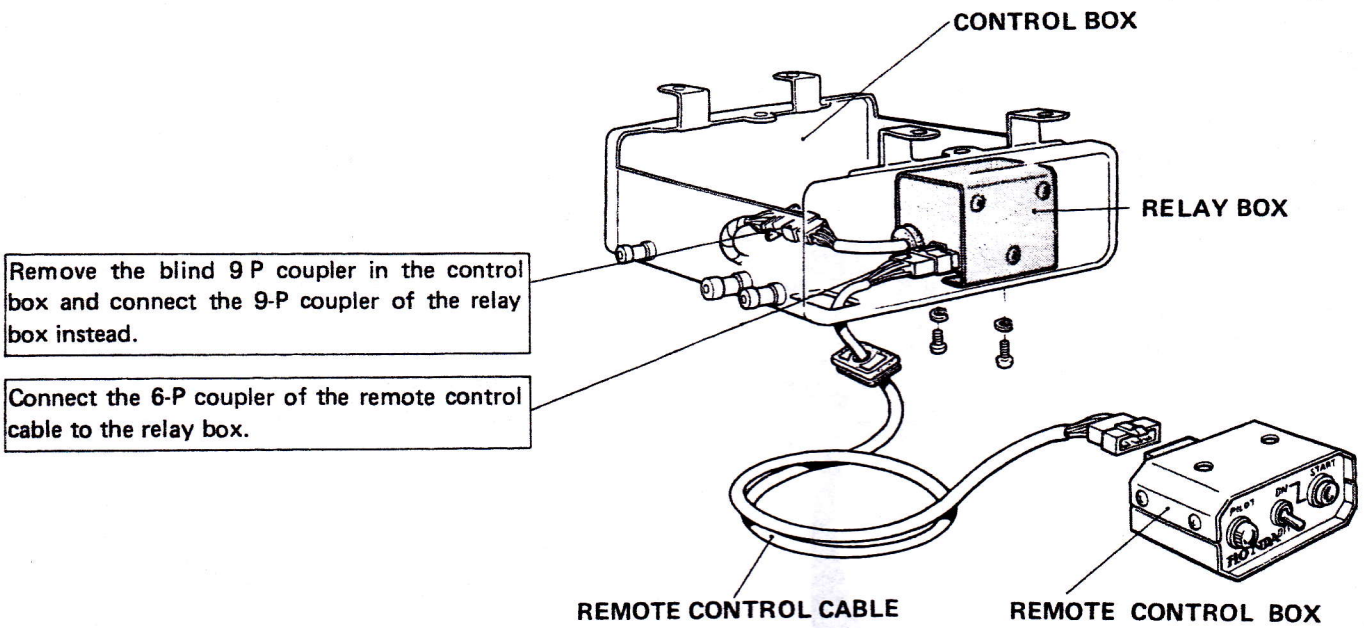
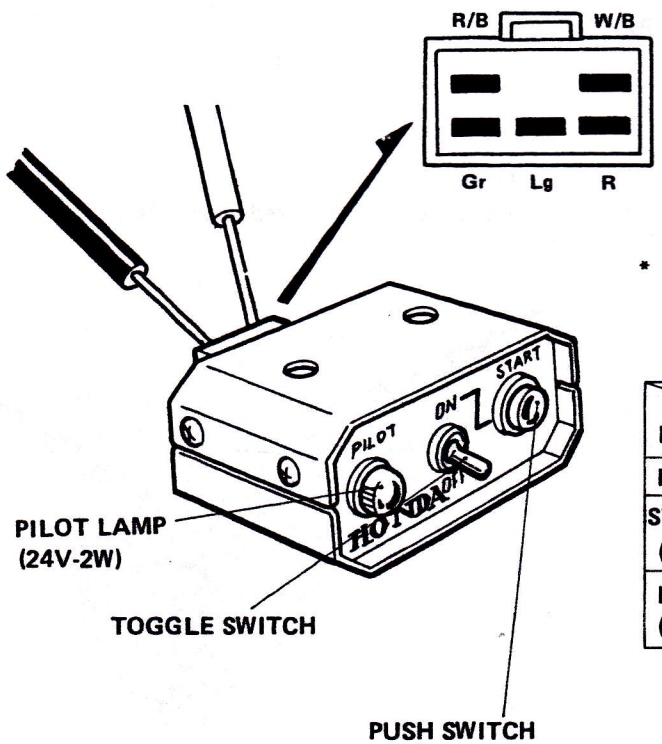
3. REMOTE CONTROL KIT (ES3500)


CONTROL BOX
RELAY BOX
Remove the blind 9 P coupler in the control box and connect the 9-P coupler of the relay box instead.
Connect the 6-P coupler of the remote control cable to the relay box.
REMOTE CONTROL CABLE
REMOTE CONTROL BOX

- REMOTE CONTROL BOX INSPECTION



* Disconnect the 6-P coupler and check for continuity in accordance with the chart below. If continuity does not exist, replace the remote control box with a new one.

Item \ Wire color	Red /Black	Green	Light green	Red	White /Black
PILOT LAMP	○——	——○			
STARTER BUTTON (PUSH)			○——	——○	
ENGINE SWITCH (ON)			○——		——○

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VII. OPERATION

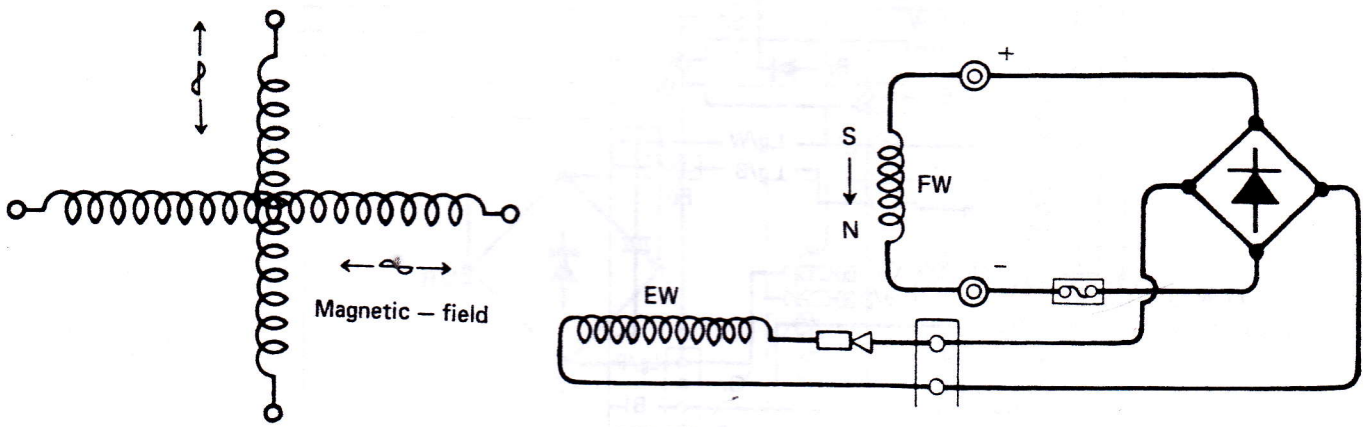
1. CONSTRUCTION AND OPERATION
2. FUEL CUT-OFF SYSTEM
3. AUTOMATIC CHOKE SYSTEM

1. CONSTRUCTION AND OPERATION

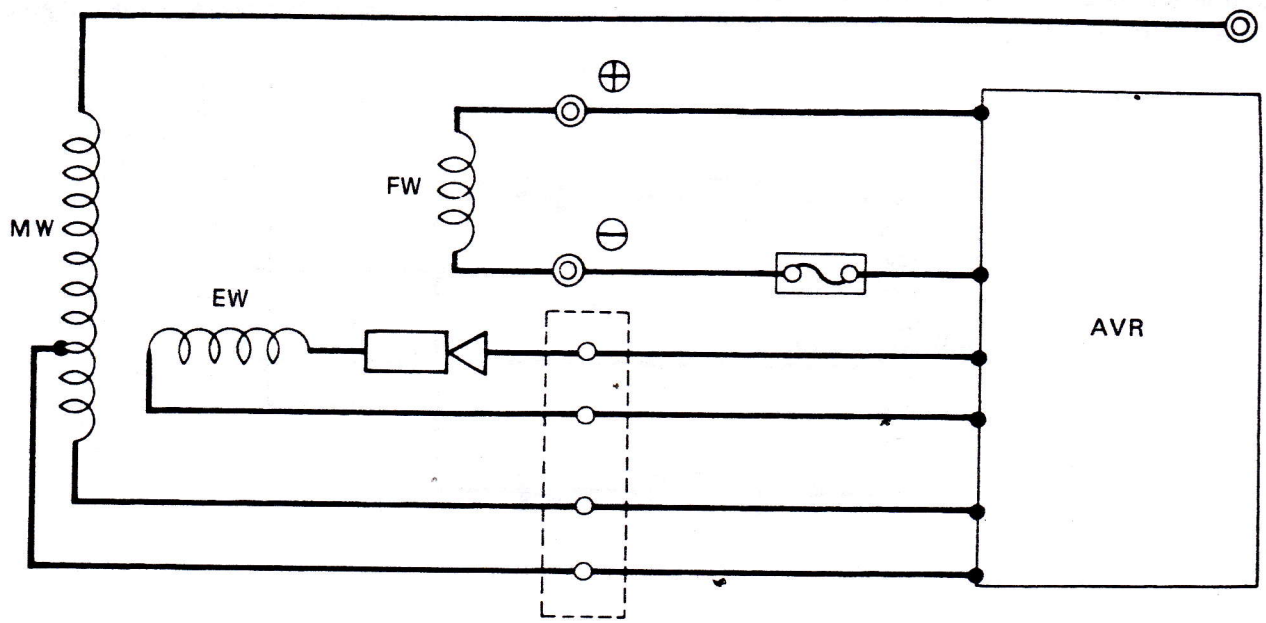
The generator is a self-exciting, two-pole revolving magnetic field type in that the magnetic-strength between the two poles of a magnet is aided by the field winding assembled around the poles. The magnet is integrated with a rotor which in turn is held in the stator and moved by the engine. Thus, when the rotor turns, current is induced in the stator auxiliary winding. The current induced is rectified by the built-in rectifier and then is fed to the field winding of the magnet poles. This current flow strengthens the magnetic field between the poles, thereby increasing the amount of current induced in the stator AC output winding.

Self-exciting Circuit:

As the engine starts, the rotor turns. This induced current in the auxiliary (exciter) winding (EW) assembled around the poles of the stator (several volts, AC). To obtain sufficient magnetic-field strength for required generator output, the current induced is rectified and fed to the field winding (FW) around the two poles of the rotating magnet.



With the rotor turning, current is also induced in the AC output winding (MW) of the stator. The magnetic-field strength between the two poles of the rotating magnet is further controlled by this current as it passes through the AVR to the rotor field winding.



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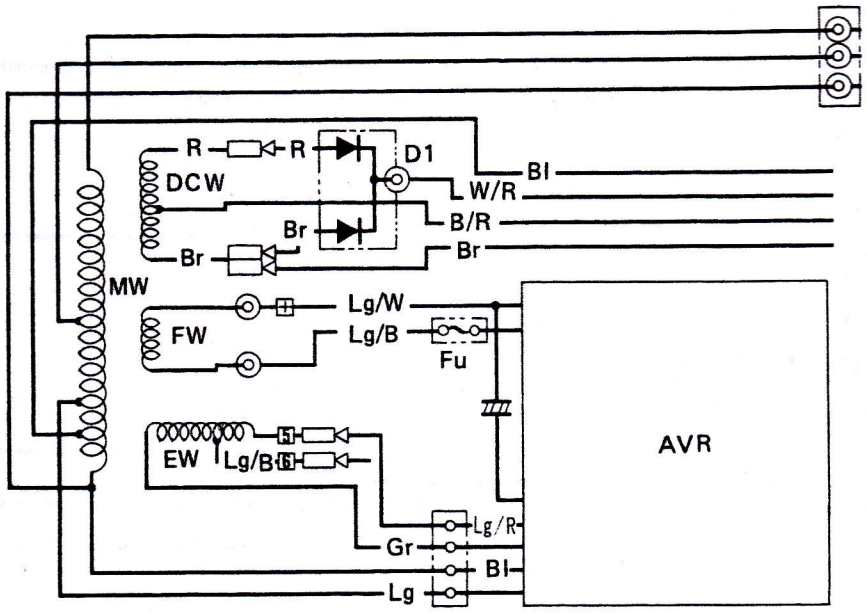
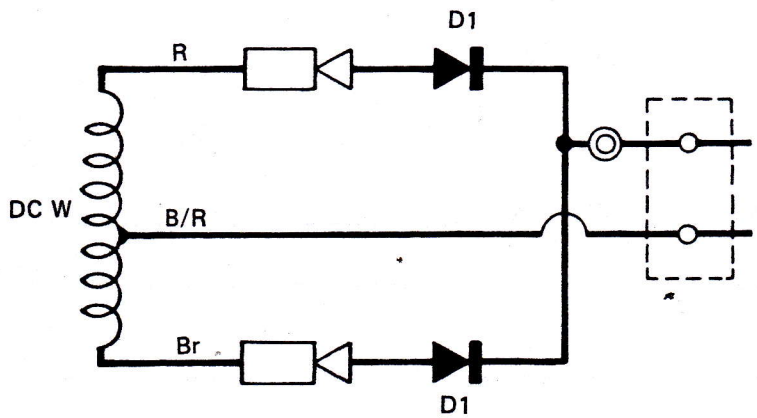
AC Output Circuit and AVR (Automatic Voltage Regulator)

As current flows through the rotor field winding (FW), voltage is induced in the stator AC output winding (MW) by the magnetic field produced around the two poles of the rotor magnet. The faster the rotor turns, the greater the voltage will be. The voltage will also increase as the current flowing through the rotor field winding (FW) increases. The output voltage is then available at the output receptacles on the control box. On E/ES3500 the output reaches the predetermined maximum at 2,000 – 2,500 rpm. Therefore, in oder to keep it from increasing beyond the safe limit at 3,600 rpm, an automatic voltage regulator (AVR) is provided. The AVR reduces current flowing through the rotor field winding (FW), so that damaging high voltage and high-current output in the AC output winding (MW) is prevented. If the output voltage falls below the rated value, the unit increases current flowing in the rotor field winding (FW). The same sequence of events takes place to maintain a constant voltage at all times. Fine adjustment of frequency can be made by turning the throttle knob either right or left as necessary.



DC Output Circuit

The DC output winding (DC W) is wound around the stator poles independently of the AC output winding (MW). The voltage induced in the winding is rectified by diodes (D1) and is sent to the DC output terminals on the control box. Although the circuit is not regulated by the AVR, the output adjustment is also possible by turning the throttle knob either right or left as necessary.



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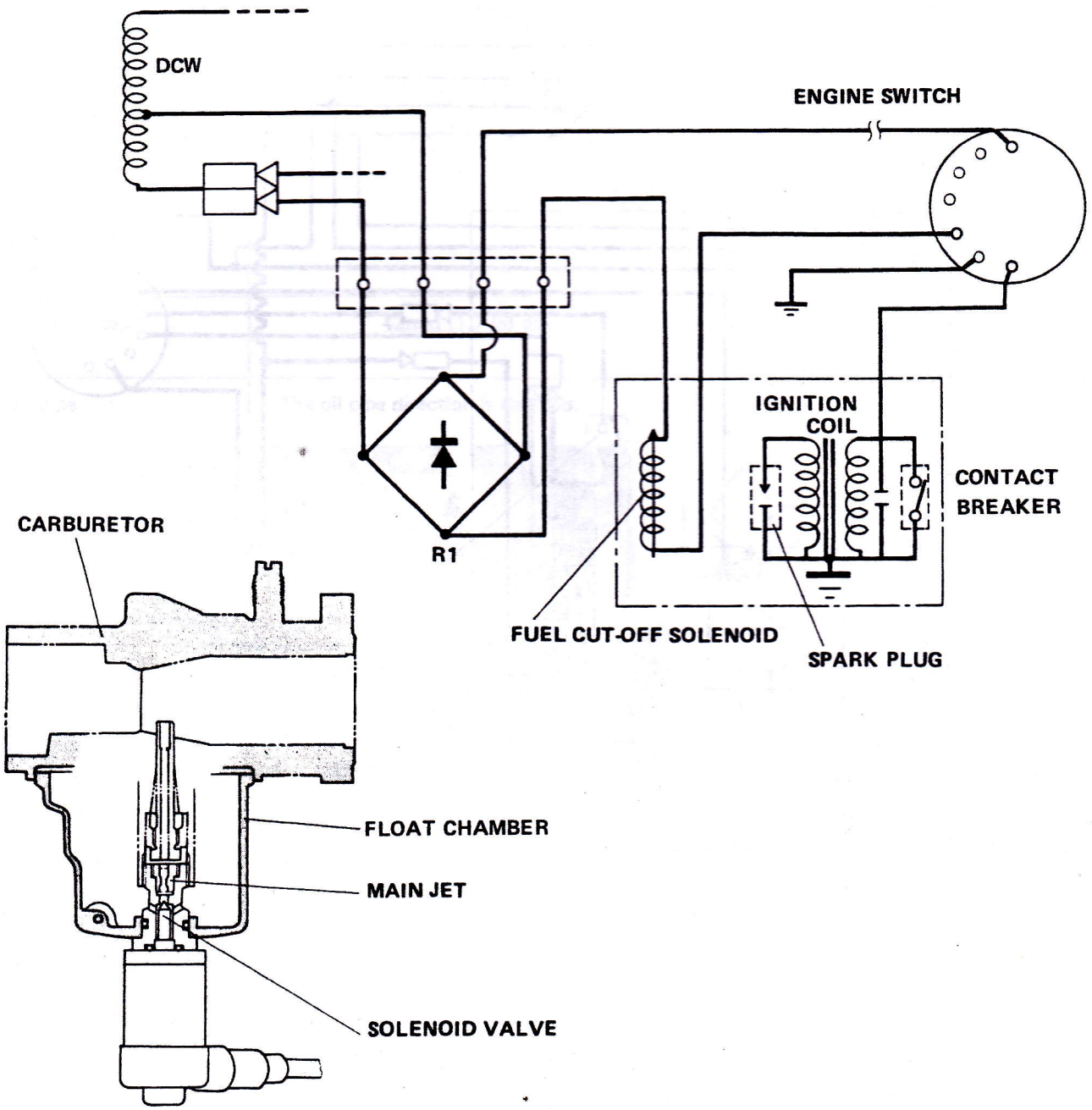
2. FUEL CUT-OFF SYSTEM

These generators employ a fuel cut-off system to prevent run-on after stopping the engine. Combined with the usual engine stopping system of grounding the primary circuit, direct current flows into the fuel cut-off solenoid when the engine is switched OFF and the energized solenoid valve closes the carburetor main jet to cut-off fuel.
DC current for the system is from the generator DC winding (DC W) and is rectified by the exclusive rectifier for this system.



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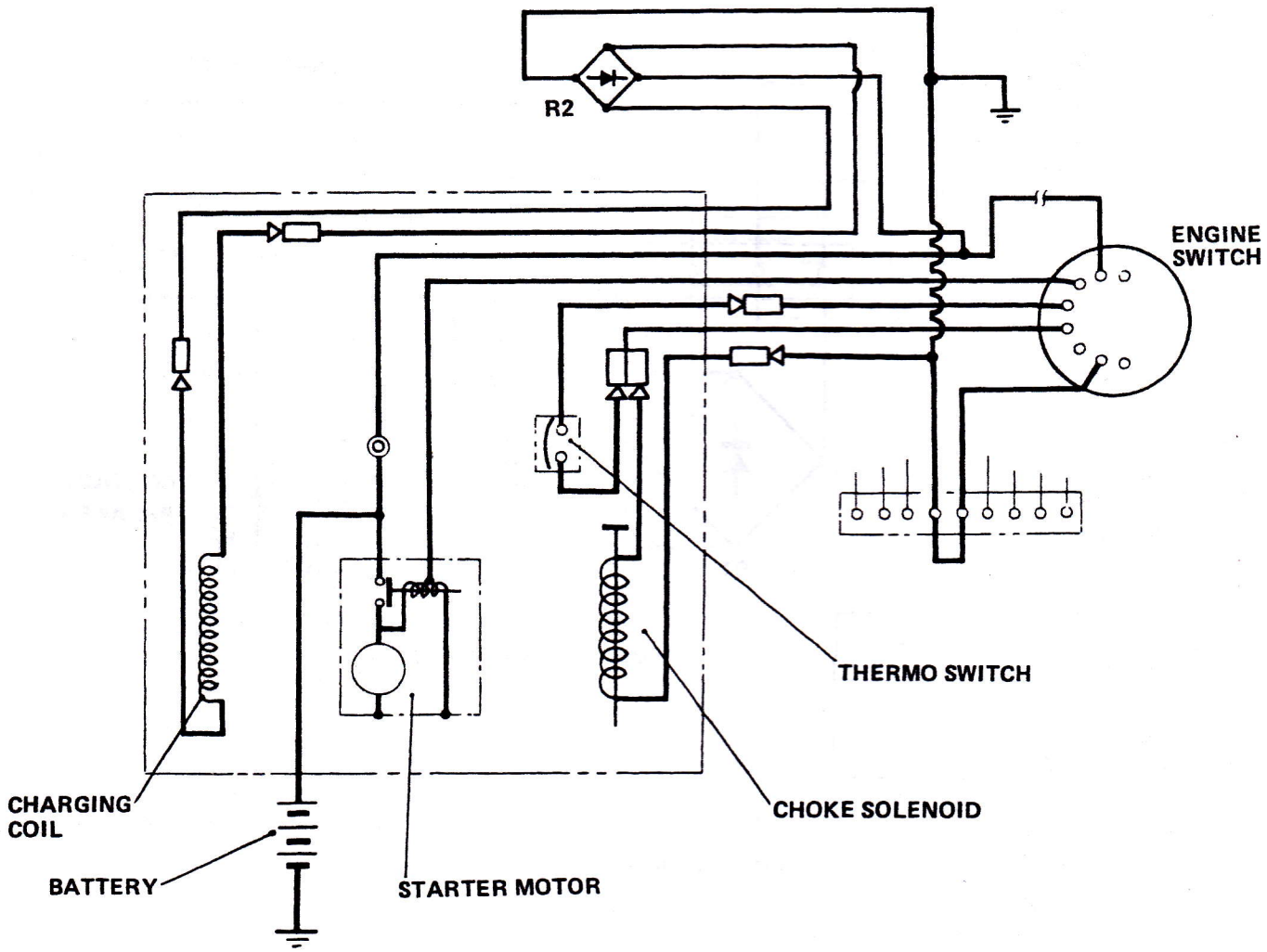
3. AUTOMATIC CHOKE SYSTEM (ES3500)

Model ES3500 is equipped with an automatic choke system for easy starting. The system is especially useful when the generator is equipped with the optional remote control kit. With the engine switch at START, the choke solenoid is energized by the current from the battery and closes the choke valve. When the engine temperature rises above 30°C (90°F), the thermo switch in the cylinder head is actuated, and the choke solenoid is energized and opens the choke valve. A manual choke rod is also installed for the manual starting.



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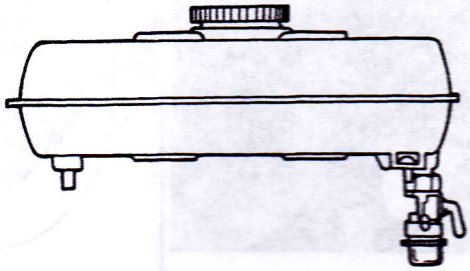
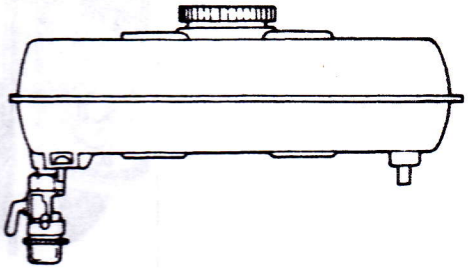
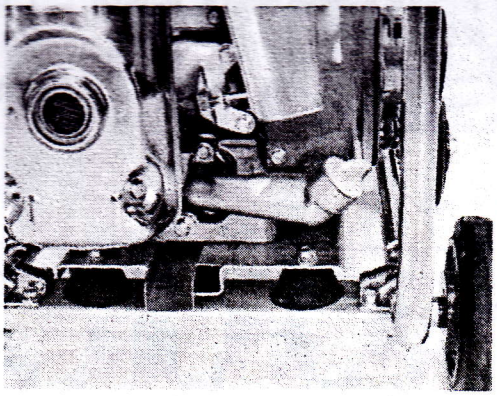
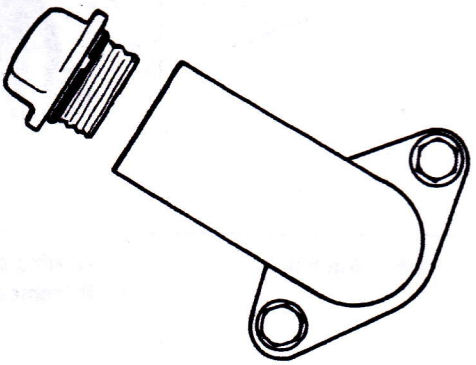
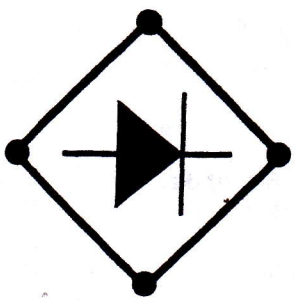
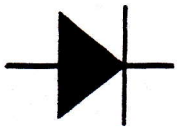
VIII. MAJOR MODIFICATIONS BETWEEN K1 AND K0

Item	K1	K0
Engine	G400	G80
Fuel tank	The fuel valve location is modified because of changes to the air cleaner and muffler. 	
Fuel filler cap	42mm (1.7 in) dia.	53mm (2.1 in) dia.
Oil pipe	The oil pipe direction is changed. 	
Rectifier (ES3500 only)	A full-wave rectifier is used for starting circuit. 	

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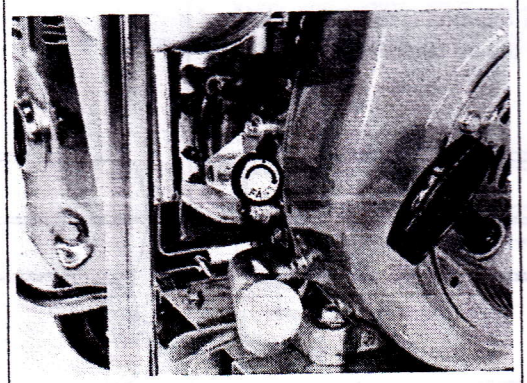
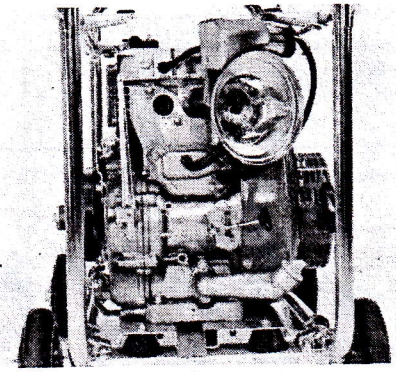
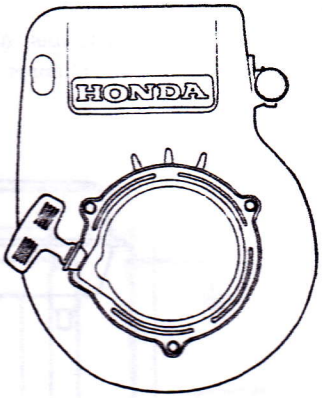
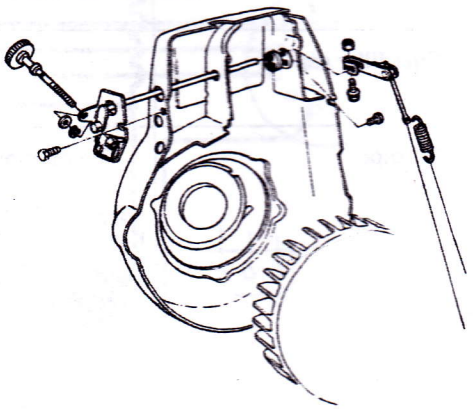
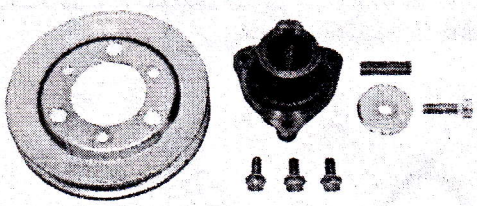
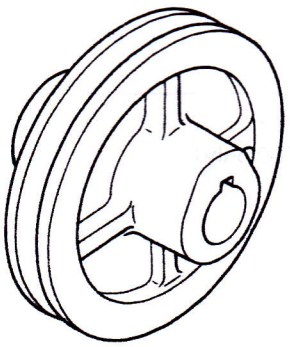
Item	K1	K0
Throttle linkage	The throttle linkage is changed.  	 
Pulleys and belt	• Casting drive pulley boss • Punch cut die pulley  Drive pulley: 156mm (6.1 in) dia. Driven pulley: 135mm (5.3 in) dia. Drive belt: B39 Engine rpm: 3,100 rpm	Casting pulley  Drive pulley: 138mm (5.4 in) dia. Driven pulley: 135mm (5.3 in) dia. Drive belt: B37 Engine rpm: 3,500 rpm

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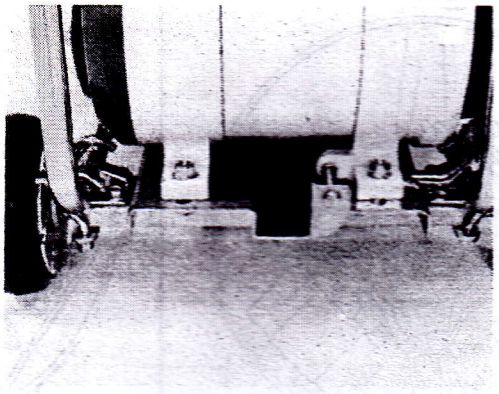
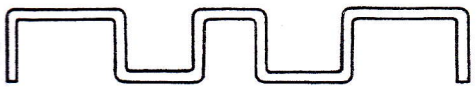
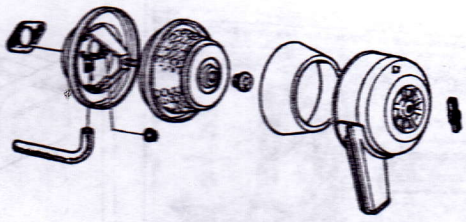
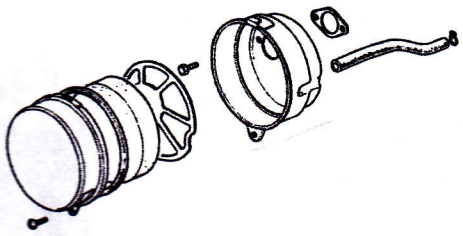
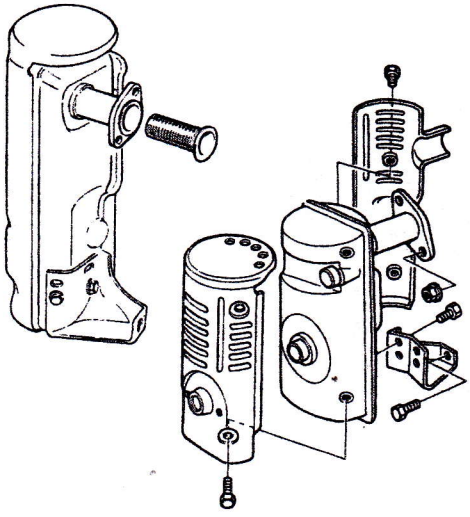
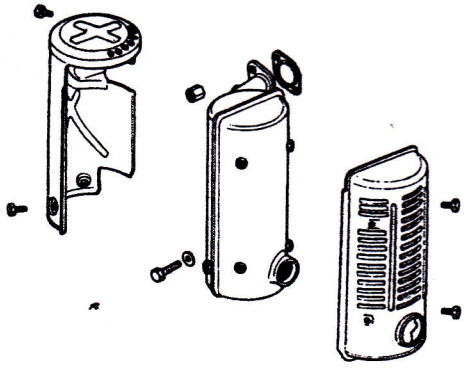
Item	K1	K0
Engine bed	The shape is changed. 	
Air cleaner	Dual element type 	Semi-dry type 
Muffler	The spark arrester can be separated from the muffler. The shape is changed. 	The spark arrester is included in the muffler. 

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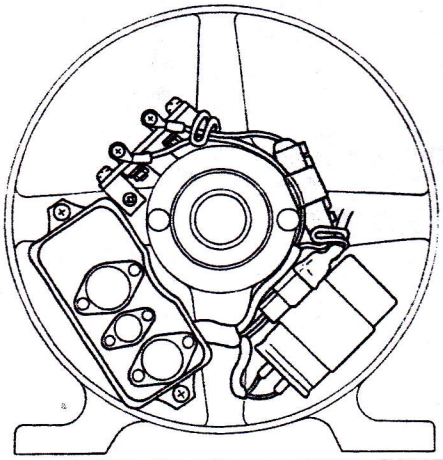
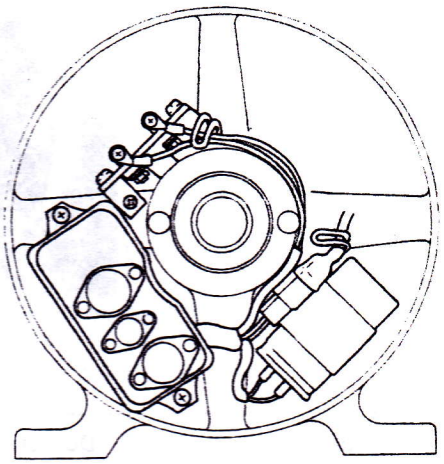
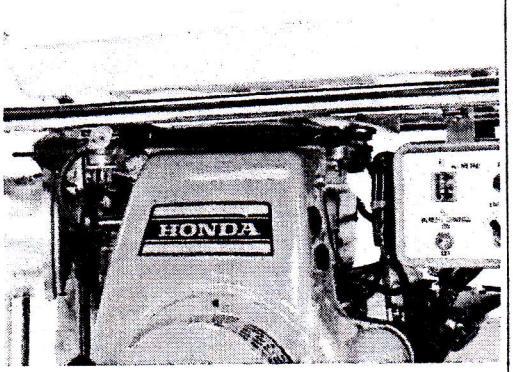
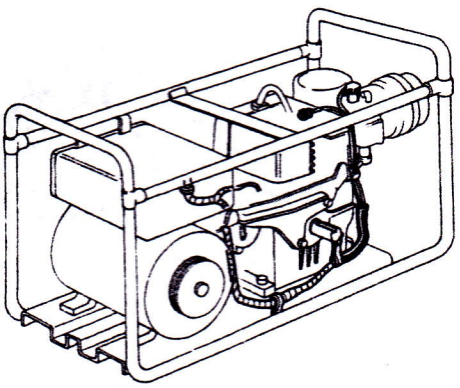
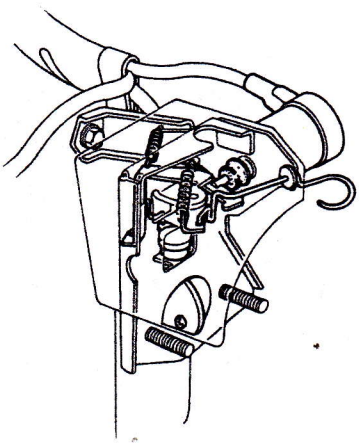
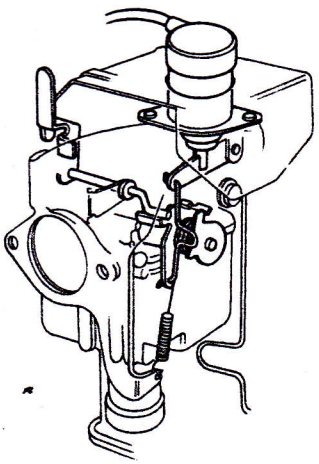
Item	K1	K0
AVR	A fuse (3.5 A) is newly added between the AVR and field coil. 	
Wire routing		
Automatic choke [ES3500 only]	The choke linkage and installation direction of the solenoid are changed. 	

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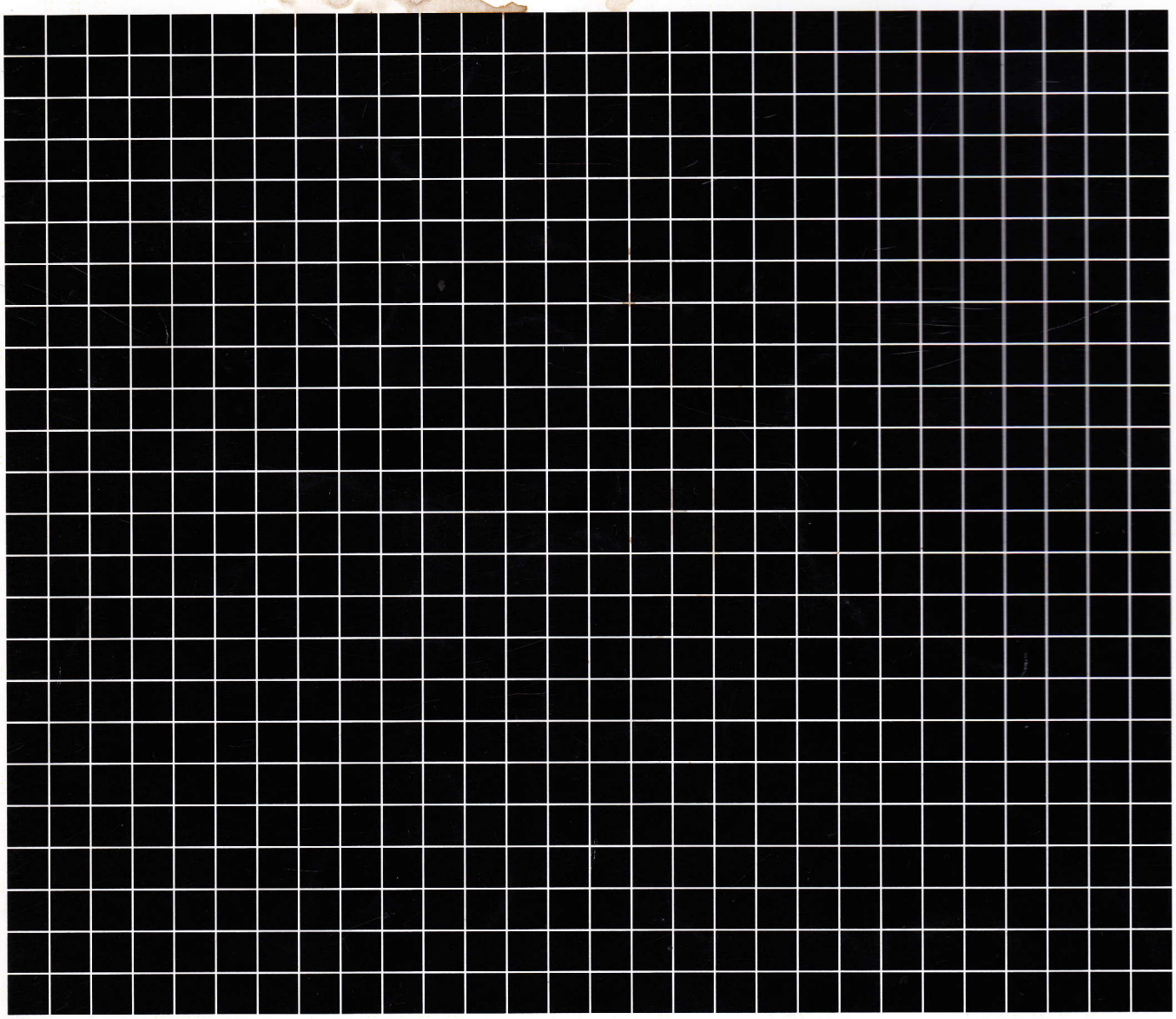
HONDA